W95674F

FINAL
REMEDIAL ACTION REPORT

SOURCE CONTROL REMEDIAL ACTION

RE-SOLVE, INC. SUPERFUND SITE
NORTH DARTMOUTH, MASSACHUSETTS

For
U.S. Environmental Protection Agency

By
Halliburton NUS Corporation
and
Raytheon Engineers & Constructors, Inc.

EPA Work Assignment No. 06-1P18
EPA Contract No. 68-W8-0117
HNUS Project No. 0211

February 1996

Halliburton NUS
CORPORATION

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1.0 INTRODUCTION

This report documents the remedial activities for the Source Control Remedy for the Re-Solve, Inc. Site (Site).

1.1 Site Location and Description

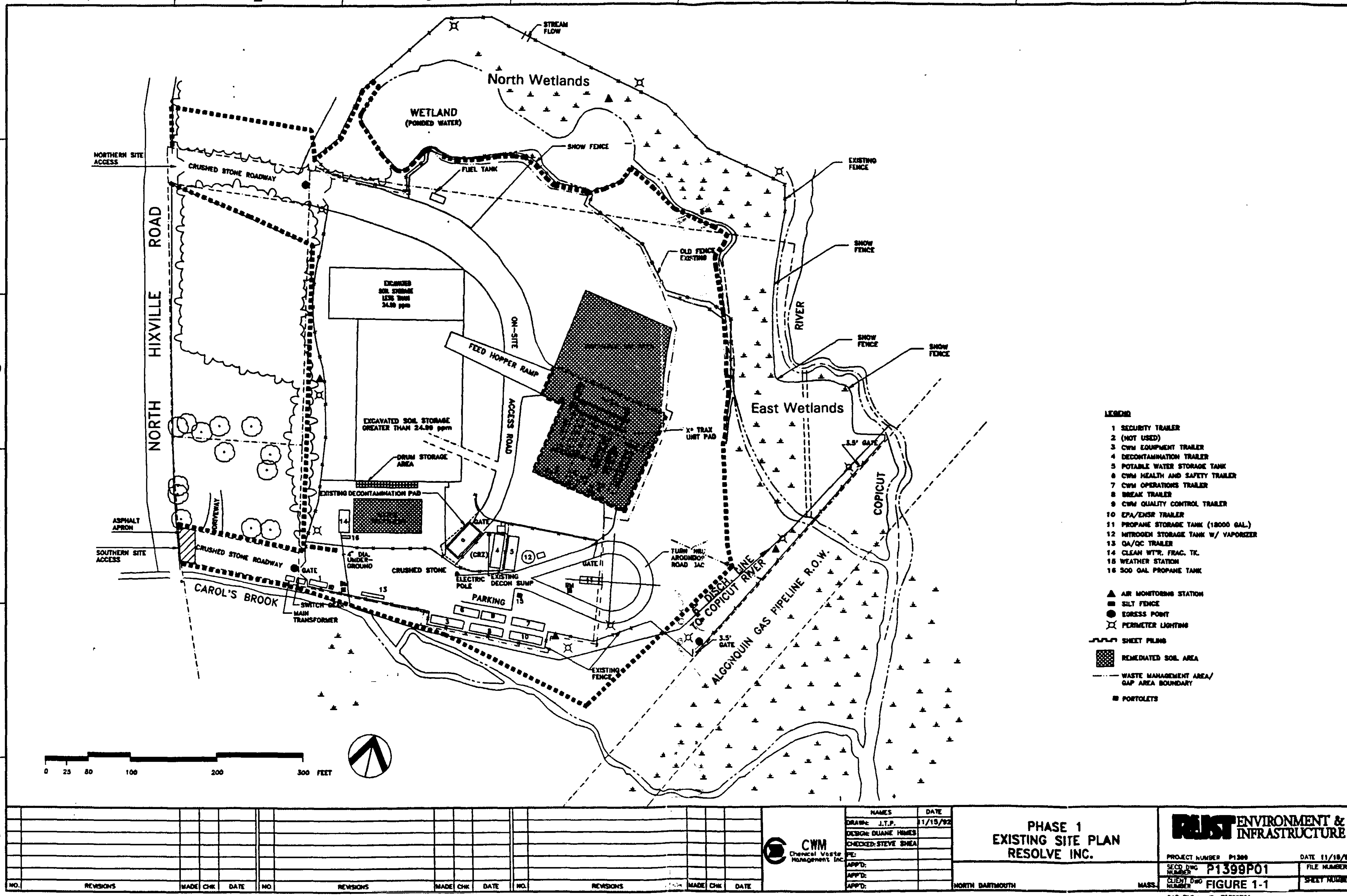
The Re-Solve, Inc. Site is a former waste chemical reclamation facility situated on a six-acre parcel of land on the east side of North Hixville Road in the southeastern Massachusetts Town of Dartmouth. The Site is bounded by wetlands to the north and east and a pine and mixed hardwood forested area to the south and west. An Algonquin Gas Pipeline right-of-way abuts the eastern boundary of the Site.

The land surrounding the Site is predominantly zoned for single family residential use, with required lot sizes of 40,000 square feet or larger. Based on the 1980 Massachusetts Census, approximately 114 people live within a one-half mile radius of the Site, and approximately 326 people live within a one mile radius of the Site. The Dartmouth Planning Board estimates that the current population within a one-half mile radius of the Site has not significantly changed since 1980, but that the population within a one-mile radius of the Site has approximately doubled since 1980 (October 1995 telephone conversation). According to the 1990 Massachusetts census, the 1990 population of the Town of Dartmouth was 27,244, which is an increase of 13.7 percent since 1980. Three residences are located within 150 yards of the Site, one to the northwest, one to the west, and the other to the southwest, and six other residences are found along North Hixville Road within one-quarter mile of the Site. All residences in the area obtain water from private wells located on their property. Some residences supplement their well water with purchased bottled water.

The Copicut River, classified as Class B by the Commonwealth of Massachusetts, is located along the eastern edge of the Site. Class B waters are designated for *protection and propagation of fish, other aquatic life, and wildlife and for primary and* secondary contact recreation. The Copicut River drains directly into Cornell Pond, approximately one-quarter mile down river from the Site. Cornell Pond is popular for sport fishing with horned pout, perch, and pickerel the common species. Outflow from Cornell Pond merges with Shingle Island River, which then flows into Noquochoke Lake, located about two miles downstream of Cornell Pond. A site locus map is provided as Figure 1-1.

1.2 Site History

Re-Solve, Inc. operated as a waste chemical reclamation facility from 1956 until its closure in 1980. A variety of hazardous materials were handled at the Site including solvents, waste oils, organic liquids and solids, acids, alkalies, inorganic liquids and solids, and PCBs.



North Wetlands
WETLAND (PONDED WATER)
STREAM FLOW
NORTHERN SITE ACCESS
CRUSHED STONE ROADWAY
FUEL TANK
SNOW FENCE
EXISTING FENCE
OLD FENCE EXISTING
NORTH HIXVILLE ROAD
ON-SITE ACCESS ROAD
FEED HOPPER RAMP
EXCAVATED SOIL STORAGE GREATER THAN 24.99 ppm
DRUM STORAGE AREA
EXISTING DECONTAMINATION PAD
X* TRAX UNIT PAD
RIVER
East Wetlands
COPICUT
3.5' GATE
ASPHALT APRON
SOUTHERN SITE ACCESS
DRIVEWAY
GATE
4" DIA. UNDER-GROUND
CRUSHED STONE
ELECTRIC POLE
EXISTING DECON SUMP
PARKING
CAROL'S BROOK
SWITCH GEAR
MAIN TRANSFORMER
DISCH. LINE TO COPICUT RIVER
ALGONQUIN GAS PIPELINE R.O.W.
0 25 50 100 200 300 FEET
LEGEND
1 SECURITY TRAILER
2 (NOT USED)
3 CWM EQUIPMENT TRAILER
4 DECONTAMINATION TRAILER
5 POTABLE WATER STORAGE TANK
6 CWM HEALTH AND SAFETY TRAILER
7 CWM OPERATIONS TRAILER
8 BREAK TRAILER
9 CWM QUALITY CONTROL TRAILER
10 EPA/ENSR TRAILER
11 PROPANE STORAGE TANK (18000 GAL.)
12 NITROGEN STORAGE TANK W/ VAPORIZER
13 QA/QC TRAILER
14 CLEAN WT'R. FRAC. TK.
15 WEATHER STATION
16 500 GAL PROPANE TANK
AIR MONITORING STATION
SILT FENCE
EGRESS POINT
PERIMETER LIGHTING
SHEET PILING
REMEDIATED SOIL AREA
WASTE MANAGEMENT AREA/ GAP AREA BOUNDARY
PORTOLETS
NO. REVISIONS MADE CHK DATE
CWM Chemical Waste Management Inc.
NAMES DATE
DRAWN: J.T.P. 11/15/92
DESIGN: DUANE HIMES
CHECKED: STEVE SHEA
PE:
APP'D:
PHASE 1
EXISTING SITE PLAN
RESOLVE INC.
NORTH DARTMOUTH MASS.
RUST ENVIRONMENT & INFRASTRUCTURE
PROJECT NUMBER
DATE 11/18/92
SECD DWG NUMBER P1399P01
FILE NUMBER
CLIENT DWG NUMBER FIGURE 1-1
SHEET NUMBER
CAD FILE NAME:
PLOT DATE:

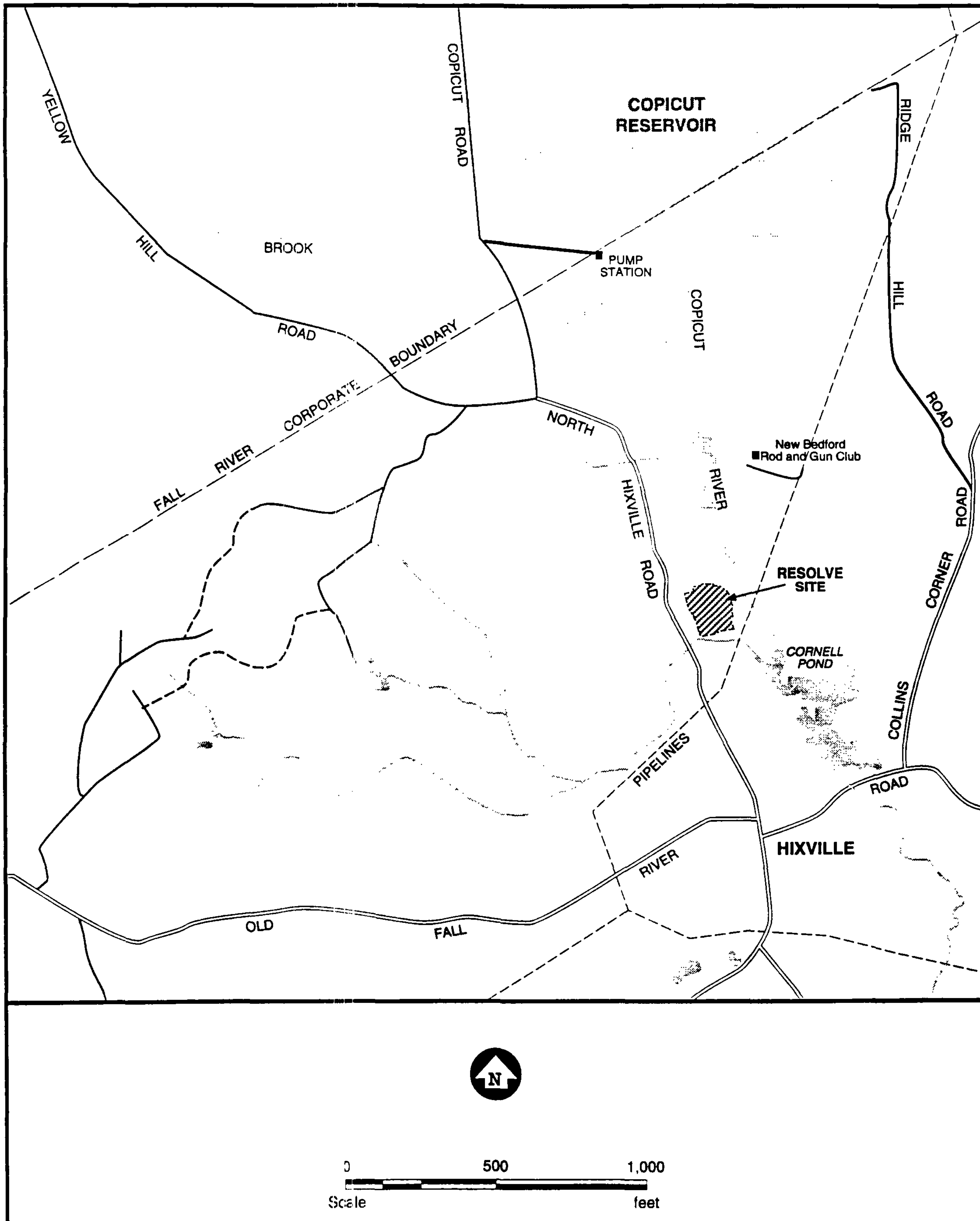
In 1974, the Massachusetts Division of Water Pollution Control issued Re-Solve, Inc. a license to collect and dispose of hazardous waste. In December of 1980, the Massachusetts Division of Hazardous Waste agreed to accept Re-Solve's offer to surrender its disposal license on the condition that all hazardous waste be removed from the Site. In late 1981, after the Massachusetts Attorney General sued Re-Solve, Inc. and its principals, Re-Solve, Inc. removed drums and other debris, including buildings, from the Site. The Site was then covered with a large quantity of sand. The contents of the four on-site lagoons, cooling pond, and oil spreading operation were not removed. The Site was placed on the NPL on September 8, 1983 (48 F.R. 40670).

EPA commenced a Remedial Investigation and Feasibility Study (RI/FS) to assess the extent of on-site source contamination in the fall of 1982. The RI/FS was completed in June of 1983. In July of 1983, a Record of Decision (ROD) was signed by the EPA Regional Administrator for the selection of a remedial action for the Site. This ROD called for the excavation of approximately 15,000 cubic yards of PCB-contaminated soils from the four lagoons, cooling pond, and oil spreading area for off-site disposal. In 1985, EPA's contractor, Army Corps of Engineers, completed the excavation of approximately 15,000 cubic yards of PCB-contaminated soil. However, studies conducted to evaluate the effectiveness of the remedial action indicated that extensive PCB contamination remained beyond the remediated lagoons, cooling pond, and oil spreading area.

A supplemental RI/FS to assess the extent of contamination that had migrated beyond the remediated areas and the boundaries of the Site was initiated in September of 1983 and completed in June of 1987. EPA published notice of completion of the FS and of the proposed plan on June 17, 1987. The final remedial action to be implemented at the Site is embodied in a Record of Decision (ROD), executed by the Regional Administrator on September 24, 1987, with the concurrence of the Commonwealth of Massachusetts. The Responsible Parties (RPs) formed the "Re-Solve Site Group" and assumed responsibility for Site remediation. A mixed funding Consent Decree was signed on May 31, 1989, requiring EPA to reimburse the RPs approximately 30 percent of the reasonable remedial action costs, but not to exceed a cap of approximately $6.9 million. EPA issued an Explanation of Significant Differences (ESD) on June 11, 1993. The RPs began the Source Control remedial action on June 21, 1993 and completed site demobilization on December 21, 1994. Figure 1-2 shows the Site, including the "waste management area" remediated during the Source Control remedial action.

1.3 Selected Remedy

The main contaminants at the Site are polychlorinated biphenyls (PCBs) and volatile organic compounds (VOCs). The remedy selected in the 1987 ROD includes both a source control and management of migration component, calling for site security, excavation and treatment of PCB-contaminated soils and sediments by on-site dechlorination, and treatment of VOC-contaminated groundwater by an on-site process involving metals removal, air stripping, and carbon adsorption. EPA issued



S.S. PAPADOPULOS & ASSOCIATES, INC.
ENVIRONMENTAL & WATER-RESOURCE CONSULTANTS

LOCATION OF RESOLVE SITE

FIGURE 1-2

an ESD in 1993 to decouple the DECHLOR (dechlorination) process from the X*TRAX (low-thermal desorption) process for on-site soil treatment (see Section 4.2).

2.0 CHRONOLOGY OF MAJOR EVENTS

The remedial action activities associated with the Source Control Remedy are summarized as follows:

DATE	EVENT
July 1, 1983	First Record of Decision signed by Regional Administrator, requiring the removal of PCB-contaminated soil from four on-site lagoons, cooling pond, and oil spreading area (OU1)
September 1985	Army Corps of Engineers completed removal of approximately 15,000 c.y. of highly contaminated PCB soils for off-site disposal
1986	Massachusetts Department of Public Health (MDPH) issued a health advisory against eating fish found in Cornell Pond and the Copicut River due to PCBs found in fish during the Remedial Investigation
September 24, 1987	Final Record of Decision signed by Regional Administrator, requiring source control (soil/sediment treatment) and MOM (groundwater treatment) remedies (OU2 and OU3, respectively)
May 31, 1989	Consent Decree signed by Regional Administrator
September 1991	Source Control pilot activities begin
May 12, 1992	X*TRAX/DECHLOR pilot test begins
June 10, 1992	X*TRAX/DECHLOR pilot test ends
June 11, 1993	EPA issues Explanation of Significant Differences to decouple DECHLOR from X*TRAX
June 18, 1993	EPA approves submittals to begin full-scale remediation
June 21, 1993	Full-scale X*TRAX operation begins
May 1994	MDPH's health advisory regarding eating fish expanded to include mercury (not Site-related)

DATE	EVENT
July 19, 1994	Full-scale X*TRAX treatment of PCB-contaminated soils and sediments is completed
October 7, 1994	Operation of WTS ends
December 14, 1994	Site Closeout Walk Over
December 21, 1994	Demobilization of Site ends
May 2, 1995	Wetlands Hydrology Inspection and Status Check on Site Closeout Issues
June 21-23, 1995	Final Site Closeout Walk Over, First Long-Term O&M Inspection, and Wetlands Restoration Inspection

EPA has determined that all the Source Control close out issues have been adequately addressed, and declared the Source Control Remedy complete.

3.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

Source Control cleanup goals (performance standards) were set in the ROD for PCBs only. As stated in the ROD, the on-site soils were also contaminated with other organic compounds, such as volatile organics, but the areal extent of contamination was similar for both PCBs and volatile organic compounds (VOCs). Therefore, Source Control cleanup goals were set only for PCBs and not for VOCs. On-site soil treatment was expected to remove a percentage of the organic compounds in soils, and the residual organic compounds will undergo further treatment, after being placed back on-site, as part of the management of migration component.

The ROD set the Source Control PCB soil cleanup level at 25 ppm in the Waste Management Area (WMA) (upland area) and at 1 ppm in the wetland sediment. The soil cleanup levels were established only for the unsaturated zone because it was not considered reasonable to assume human health contact with soils below the groundwater table. EPA based the Source Control soil cleanup level of 25 ppm on a 10^{-5} risk level to potential dermal exposure for the average case under future site use conditions. EPA considered the following factors in selecting the PCB sediment cleanup level of 1 ppm: the range of PCB sediment concentrations (0.13 ppm to 2.5 ppm) associated with adverse impacts to benthic organisms; location and concentration of PCB contamination; and, adverse environmental impacts.

The ROD required that the disturbed wetlands be restored to their original condition through a wetland restoration program. The Scope of Work (SOW) for Remedial Design and Remedial Action, which is Appendix 2 of the Consent Decree, defined that the wetlands will be considered successfully restored when the vegetation of the restored wetlands is "within plus or minus 10 percent, as measured by comparing the percent of herbaceous and woody cover existing on the Site under pre- and post-remediation conditions." The average of the pre-remediation downgradient canopy cover was approximately 90 percent. Therefore, attaining a level of total cover within plus or minus 10 percent of the 90 percent total vegetation cover (range of 81 percent to 99 percent of total cover) that currently exists in all wetland areas is the goal. In addition, the SOW stipulated that the wetlands be of sufficient diversity to provide habitat for a balanced indigenous animal community and that the wetlands be restored to meet conditions established by Federal and State standards.

The ROD also required air monitoring during excavation activities using sampling stations located at the perimeter of the Site. It called for monitoring VOCs and PCBs in vapor phase, and metal and PCB particulates, but performance standards were determined after the ROD was signed. Perimeter air monitoring action levels using real-time instruments were as follows:

Parameter	Action Level	Response
VOCs	5 ppm above background for 15 minutes or 0.5 ppm average above background for 8 hours (0900 - 1700 hrs)	Stop excavation, initiate vapor control measures, implement Contingency Plan if needed
Dust	5 mg/m^3 above background for 15 minutes or 0.15 mg/m^3 average above background for 24 hours	Stop excavation, initiate dust control measures, implement Contingency Plan if needed

In addition to ROD-specified performance standards, requirements were added after the ROD was signed relating to discharge of treated water from the on-site water treatment system (WTS) and air emissions from the X*TRAX system and the WTS. Tables 3-1 and 3-2 show the daily and monthly effluent discharge limits. When the biological treatment system was installed in February 1994 to treat the X*TRAX condensate, ammonia, nitrate-nitrite, and total phosphorus were added to the monthly parameter list.

One change to the WTS discharge limits was made during full-scale remediation. It was discovered that the acetone limit published by the Massachusetts Department of Environmental Protection, Office of Research and Standards in the "Drinking Water Standards and Guidelines for Chemicals in Massachusetts Drinking Waters, updated: Spring 1993" was 3 mg/L, and not the 0.7 mg/L used to determine the effluent limit for acetone. Based on this limit, EPA approved a request to change the monthly effluent discharge limit for acetone from 0.7 mg/L to 3.0 mg/L, and to change the daily limit to 15 mg/L. This request was approved by EPA on February 16, 1994 contingent upon an increase in the frequency of bioassay testing from semi-annually to quarterly for the duration of the Source Control Remedy and for one year after the implementation and start-up of the Management of Migration Remedy.

Another change occurred in the method used to average the daily and/or weekly WTS effluent concentrations for the month. Initially, the monthly effluent concentration was based on averaging all of the daily or weekly concentrations for that one month. The use of a straight numerical average was based on the assumption that the WTS would operate on a fairly regular basis and that sampling would be conducted on a regular once per week schedule. In practice, operation of the WTS was not always regular and the sampling schedule was decreased during periods of minimal operation. The sampling schedule was increased when closer monitoring of the effluent was desired. The straight numerical average was therefore not always representative of the actual monthly average. EPA approved a procedure for calculating a flow-weighted average in December 1993.

TABLE 3-1
WATER TREATMENT SYSTEM EFFLUENT RESULTS (ACUTE)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS

	Daily Limit	Range of Results[1]	Frequency of Detections[2]	Average Result[2]
Volatile Organics	ug/L	ug/L		ug/L
Chloromethane	250	ND		
Vinyl chloride	37500	ND		
Chloroethane	250	ND		
Methylene chloride	350	ND - 200	3	98
Acetone	3500; 15000[3]	ND - 15,000	57	1533
1,1-Dichloroethene	230	ND		
1,1-Dichloroethane	500	ND		
1,2-Dichloroethene (total)	250	ND		
Chloroform	33500	ND		
Methyl ethyl ketone	1750	ND - 52	1	52
1,2-Dichloroethane	7000	ND		
1,1,1-Trichloroethane	500	ND		
Trichloroethene	2300	ND		
Benzene	5000	ND		
1,1,2-Trichloroethane	3000	ND		
Methyl isobutyl ketone	1750	ND		
2-Hexanone	3500	ND		
Tetrachloroethene	250	ND		
Toluene	500	ND		
Chlorobenzene	1400	ND		
Ethylbenzene	500	ND		
Xylenes	500	ND		
PCBs (ug/L)	0.5	ND - 120	16	13.8[4]

TABLE 3-1
WATER TREATMENT SYSTEM EFFLUENT RESULTS (ACUTE)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS
PAGE 2

	Daily Limit	Range of Results[1]	Frequency of Detections[2]	Average Result[2]
Semi-Volatile Organics	ug/L	ug/L		ug/L
Phenol	500	ND		
1,3-Dichlorobenzene	500	ND		
1,4-Dichlorobenzene	500	ND		
1,2-Dichlorobenzene	500	ND		
2-Methylphenol	500	ND		
4-Methylphenol	500	ND		
Isophorone	43000	ND		
2,4-Dimethylphenol	500	ND		
2,4-Dichlorophenol	500	ND		
1,2,4-Trichlorobenzene	500	ND		
Naphthalene	500	ND		
Acenaphthene	500	ND		
Di-N-butylphthalate	500	ND		
Bis(2-ethylhexyl) phthalate	425	ND		
Acetophenone	500	ND		
Inorganics	mg/L	mg/L		mg/L
Arsenic, total	0.05	ND - 0.05	4	0.019
Beryllium, total	0.025	ND		
Cadmium, total	0.05	ND		
Chromium, total	0.093	ND		
Copper, total	0.053	ND		
Iron, total	5.7	ND - 1.3	11	0.264
Lead, total	0.075	ND - 0.007	4	0.0055

TABLE 3-1
WATER TREATMENT SYSTEM EFFLUENT RESULTS (ACUTE)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS
PAGE 3

	Daily Limit	Range of Results[1]	Frequency of Detections[2]	Average Result[2]
Manganese, total	5.7	ND - 14	67	1.183
Nickel, total	0.5	ND		
Zinc, total	0.37	ND		
pH	6-9.5	(Not Calculated)		
Total Suspended Solids	30	ND		

NOTES:

1. ND = Not Detected above the detection limit set by the laboratory.
2. Includes only results that were greater than the detection limit.
3. The daily limit for acetone was raised from 3500 ug/L to 15,000 ug/L in March 1994.
4. This average value includes two respective detections of 95 and 120 ug/L.

TABLE 3-2
WATER TREATMENT SYSTEM EFFLUENT RESULTS (CHRONIC)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS

	Monthly Limit	Range of Monthly Averages[1]	Frequency of Mo. Avg. Detections[2]	Average Monthly Average[2]
Volatile Organics	ug/L	ug/L		ug/L
Chloromethane	50	ND		
Vinyl chloride	7500	ND		
Chloroethane	50	ND		
Methylene chloride	72	ND - 36	2	34.5
Acetone	700; 3000[3]	ND - 4300	8	1190
1,1-Dichloroethene	46	ND		
1,1-Dichloroethane	100	ND		
1,2-Dichloroethene (total)	50	ND		
Chloroform	6700	ND		
Methyl ethyl ketone	350	ND - 27	1	27
1,2-Dichloroethane	1400	ND		
1,1,1-Trichloroethane	100	ND		
Trichloroethene	460	ND		
Benzene	1000	ND		
1,1,2-Trichloroethane	600	ND		
Methyl isobutyl ketone	350	ND		
2-Hexanone	700	ND		
Tetrachloroethene	51	ND		
Toluene	100	ND		
Chlorobenzene	280	ND		
Ethylbenzene	100	ND		
Xylenes	100	ND		
PCBs (ug/L)	0.1	ND - 12.3	7	1.96

TABLE 3-2
WATER TREATMENT SYSTEM EFFLUENT RESULTS (CHRONIC)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS
PAGE 2

	Monthly Limit	Range of Monthly Averages[1]	Frequency of Mo. Avg. Detections[2]	Average Monthly Average[2]
Semi-Volatile Organics	ug/L	ug/L		ug/L
Phenol	100	ND		
1,3-Dichlorobenzene	100	ND		
1,4-Dichlorobenzene	100	ND		
1,2-Dichlorobenzene	100	ND		
2-Methylphenol	100	ND		
4-Methylphenol	100	ND		
Isophorone	8600	ND		
2,4-Dimethylphenol	100	ND		
2,4-Dichlorophenol	100	ND		
1,2,4-Trichlorobenzene	100	ND		
Naphthalene	100	ND		
Acenaphthene	100	ND		
Di-N-butylphthalate	100	ND		
Bis(2-ethylhexyl) phthalate	85	ND		
Acetophenone	100	ND		
Inorganics	mg/L	mg/L		mg/L
Arsenic, total	0.01	ND - 0.05	1	0.05
Beryllium, total	0.005	ND		
Cadmium, total	0.01	ND		
Chromium, total	0.05	ND		
Copper, total	0.038	ND		
Iron, total	5.7	ND - 0.86	5	0.27
Lead, total	0.015	ND - 0.006	2	0.0055
Manganese, total	5.7	0.12 - 10	15	1.51

TABLE 3-2
WATER TREATMENT SYSTEM EFFLUENT RESULTS (CHRONIC)
(JULY 1993 - OCTOBER 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS
PAGE 3

	Monthly Limit	Range of Monthly Averages[1]	Frequency of Mo. Avg. Detections[2]	Average Monthly Average[2]
Nickel, total	0.1	ND		
Zinc, total	0.33	ND		
pH	6-9.5	7.12 - 9.3		7.99
Total Suspended Solids	20	ND		

NOTES:

1. ND = Not Detected above the detection limit set by the laboratory.
2. Includes only results that were greater than the detection limit.
3. The monthly limit for acetone was raised from 700 ug/L to 3000 ug/L in March 1994.

The WTS effluent toxicity (bioassay) testing action levels, as described in EPA's letter dated February 23, 1993, are the following: For the 7-day chronic bioassay analysis, the Action Level or the no chronic effect level from the bioassay test (NOEC), expressed as a percent of effluent, should be set equal to or greater than the instream waste concentration. The instream waste concentration would be equal to the average effluent flow in cfs divided by the average effluent flow plus the 7Q10 flow of the river. For the 48-hour acute bioassay analysis, the acute result of the bioassay test should have an LC50 (percent of effluent that kills 50 percent of the organisms) equal to or greater than 100 percent effluent.

The WTS air emissions action levels for scheduling carbon changeouts are described in the Water Treatment System Air Monitoring Parameters, which is an attachment to an October 27, 1993 RUST Remedial Services (RUST) letter regarding WTS Vapor Phase Carbon Monitoring. This attachment is contained in Appendix A of this document. Sections 3.2 and 4.2.1 of this document describe changes made to these procedures and action levels.

The X*TRAX process vent maximum emission rate was set at 0.38 lb/hr of total hydrocarbons (THC), calculated based on 150 ppm of THC in the untreated soil, a processing rate of 150 tons of soil per day, and 80 percent reduction of THC across the carbon vessel. This limit was based upon the RCRA Subpart AA process vent emission regulation. Total VOC limits are established at 3.0 lbs/hr. X*TRAX used a fraction of this limit, setting the process vent emission limit at 0.38 lbs/hr.

All of the tanks used to collect and temporarily store condensed water and organics were vented through a collection system, which included a pair of carbon adsorbers for organic vapor removal. The tank vent carbon adsorber breakthrough level was defined as 1300 ppm-Vc or greater using a Flame Ionization Detector (FID), requiring changeout of the carbon. The biological treatment system was vented through a carbon adsorber for organic vapor removal. The bio-reactor vent carbon adsorber breakthrough level was defined as 140 ppm-Vc or greater using an FID.

3.1 Compliance with ROD-Specified Performance Standards

To ensure that all PCB-contaminated soil above the specified cleanup level of 25 ppm was removed, or until the Seasonal Groundwater Low (SGL) elevation was encountered, approximately 900 post-excavation samples of the excavation sidewalls and floors were collected and analyzed for PCBs. Post-excavation sidewall samples were collected at approximately 50-foot intervals. Post-excavation floor samples were collected at a minimum frequency of one sample per 2500 square-foot area. A contiguous area with a maximum elevation difference of two feet between the lowest and highest points was considered to be one floor area and was represented by one sample (up to 2500 square feet.) Whenever a result exceeded the cleanup level, additional excavation and subsequent re-sampling of the associated area took place according to the Field Operations Support Plan (FOSP). Specifically, high post-excavation floor samples required excavation of one additional foot. High post-excavation sidewall samples required an additional excavation of five feet (three feet if the PCB concentration was below 40 ppm). The excavation and sampling complied with the requirements specified in the Consent Decree. As shown on the "as built" excavation maps following Section 8.0 of this document, all final post-excavation sample results were below 25 ppm. Post-excavation topographic plans for all areas excavated are also included following Section 8.0 of this document.

Sediment samples were also collected to ensure that all wetland sediment at levels above the specified cleanup level of 1 ppm of PCBs was removed. In order to minimize the disruption of the wetlands, pre-excavation samples were collected at a frequency of approximately every 50 feet along the horizontal border of the planned excavation. Results of sampling of the excavated East Wetlands sediment indicated that some material in the East Wetlands contained PCBs at a level greater than 25 ppm. Additional excavation was completed in specific areas and post-excavation samples were collected to verify that no sediment with greater than 1 ppm PCB remained in the East Wetlands. Consistent with the vertical excavation limit in the balance of the Site, this excavation was performed to a maximum depth of the extrapolated SGL (el. 79). All final pre-excavation and post-excavation sample results met the sediment cleanup standards. These sample results are shown on the "as built" wetland area excavation maps following Section 8.0 of this document.

The treated soil product from X*TRAX was monitored for PCBs to ensure that the treatment criterion of 25 ppm was achieved before it was returned to the Site. All results for treated soil that was later backfilled were below 25 ppm, as shown on Table 3-3. All treated soil was discharged to and held in five day bins. A grab sample was collected every six hours from the product conveyor while the bin was being filled. Once the bin was filled, which took about one day, the grab samples were composited into one sample for PCB analysis. During operations, only one sample of a total of over 250 treated soil samples was greater than 25 ppm, requiring re-treatment through X*TRAX. The overall average treated soil concentration backfilled on-site was 2.8 ppm.

Wetland restoration, including backfilling using clean off-site soil and a mushroom compost amendment, placement of root wads to create hummocks, and planting various trees, shrubs, and plants, was performed according to the Wetland Restoration Plan, except for the following plant changes:

- Additional chokeberry compensated for a shortage of swamp azalea.
- Based on existing site conditions and plant availability, one-half of the pickerel weed plants proposed were replaced with soft stem bulrush, arrowhead, and knotted rush.
- Twelve additional mature spatterdock were added to supplement the 200 individuals planted according to the Plan.

TABLE 3-3
TREATED SOIL PCB RESULTS
(JUNE 1993 - JULY 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS

Samples	Performance Standard	Range of Results	Average Result
Treated Soil	25 ppm	0.59 - 21 ppm[1]	2.8 ppm

1. Includes only results for treated soil that was later backfilled.

Sufficient diversity of species was planted. Although it is too early to determine whether sufficient diversity of species will survive, additional plants have been planted subsequent to the restoration to replace those that were subject to the highest mortality. Site inspections are being performed twice yearly during the first two growing seasons to document the status of the created/restored wetlands.

Information collected during the inspections includes a qualitative estimate of the overall health and vigor of the planted vegetation, quantitative information on plant cover and survivorship, and photographs of the Site. A visual estimate of cover in the emergent wetland portions of the created/restored wetland is derived from randomly spaced one-square meter quadrats located along a transect beginning at fixed points. The first Wetland Monitoring Inspection took place on September 21, 22, and 23, 1994 and the second inspection took place on June 21, 22, and 23, 1995.

By the September 1994 inspection, both wetland restoration areas had extensive areas of lush emergent wetland plant communities, possessing relatively high vegetative cover and moderate diversity after only four months of growth, especially in wet or inundated areas. As described in Section 3.0 of this document, the wetlands restoration is considered successful when the vegetation cover ranges between 81 percent and 99 percent. In June 1995, the North Wetlands vegetative cover was estimated at 75.9 percent, and the East Wetlands was estimated at 87.9 percent. The combined total vegetative cover was estimated at 82.6 percent. Based on the findings of the June 1995 inspection, the prognosis for the eventual development of the restored wetlands into forested wetlands appears to be excellent. The third Wetland Monitoring Inspection took place on September 27, 1995. The final results of the September 1995 inspection are not yet available.

Perimeter air monitoring was performed using real-time instruments (MicroTIP photoionization detector for VOCs and Miniram dust monitor) and filter/media. The filter media sample results were used as a comparison to real-time monitoring, primarily for identification of contaminants, but did not have action levels. The perimeter air monitoring stations were connected to a computer, which recorded continuous readings, in the Health and Safety trailer. The monitoring station alarms were triggered when a VOC level of 5 ppm above background or a dust level of 5 mg/m^3 above background was detected.

At the end of October of 1993, the Source Control Remedy contractor reported that several daily-average perimeter station VOC and dust readings had been above the action level, but had not been reported to EPA per the Field Operations Support Plan. As a result of an investigation by the contractor, it was determined that 50 such events occurred between June 19 and October 31, 1993. Each event was evaluated and the RP contractor and EPA concluded that 48 of the 50 events were not related to Site activities. The evaluation found that these events were caused by instrument problems (e.g., incorrect calibration, recording device registered a reading greater than zero when the instrument read zero, atmospheric moisture causing a false positive reading, or equipment malfunction), or were not Site related due to wind direction. The remaining two events were evaluated to assess their potential health impacts;

EPA concluded that there had been no potential health impacts at or beyond the perimeter of the Site.

As a result of these problems, manufacturer's representatives and a consultant visited the Site and recommended instrument modifications, which were implemented. RUST's letter dated December 21, 1993 describes these modifications and is included in Appendix B of this document. Once it was discovered that some of the total VOC and dust levels were above action levels, the Contractor quickly developed and implemented a Corrective Action Plan for the Perimeter Monitoring Action Levels and Response Program. The Corrective Action Plan included increased calibration of equipment to twice daily, the performance of station checks four times daily to minimize instrument error, and a change of alarm levels for internal notification and action to 2.15 ppm for VOCs and 2.5 mg/m^3 for dust to ensure an early response to potential exceedances due to actual field conditions and to reduce false exceedances due to instrument errors. The Corrective Action Plan is also included in Appendix B of this document.

Once per week, a set of integrated samples for respirable dust, PCBs in vapor and in dust, lead, and several VOCs was collected at the downwind perimeter monitoring station as determined by the on-site meteorological station. This monitoring consisted of using calibrated air sampling pumps to pull a measured volume of air through filter and/or absorbent media, which were then sent for analysis at an off-site laboratory. During the Source Control remediation, two changes were made in the frequency of sampling for these parameters. The sampling frequency was increased on December 10, 1993 to once per week at <u>each</u> perimeter monitoring station in response to EPA's concern regarding wind shifts during each sampling period. The sampling frequency was again changed on March 21, 1994: one set of perimeter filter media samples was collected daily at each station over a full 24-hour period. Samples collected from each station were analyzed once per month. In addition, samples were analyzed on any day that an exceedance of the perimeter air monitoring station action levels occurred.

3.2 Compliance with non-ROD-Specified Performance Standards

Monitoring of the WTS effluent consisted of daily, weekly, monthly, and semi-annual sampling. During the first five days of continuous operation, daily sampling for VOCs, semi-volatile organic compounds (SVOCs), PCBs, and metals was conducted. On days 1 and 5, the effluent was analyzed for the full list of parameters. On days 2, 3, and 4, the effluent was analyzed for VOC and metals indicator parameters only. Following the initial daily analysis, the frequency of sampling was determined by the frequency of operation. Monthly and weekly samples were collected during continuous operation. During periods of intermittent operation, sampling frequency generally depended on the volume of wastewater processed. A sample was collected after every 4 million gallons of water processed for the monthly parameters and after every 1 million gallons for the weekly parameters. This provided the same monitoring intensity required during continuous operation.

WTS effluent results (shown on Tables 3-1 and 3-2) during the full-scale remediation were within the discharge limits except for several manganese, acetone, and PCB exceedances. Minor manganese, acetone, and/or PCB exceedances occurred in October, November, and December of 1993, and January, June, July, August, and October of 1994. A minor arsenic exceedance occurred in September 1994. In all of these cases, EPA directed RUST to calculate the allowable discharge flow rate based on the actual river flow rate and the actual maximum daily concentration or monthly average concentration. Because the effluent discharge limits were calculated based on a higher effluent discharge rate and lower river flow rate, the actual manganese, acetone, and/or PCB loading in the river never exceeded the loading based on the flow and discharge concentrations assumed in the effluent discharge limits. Therefore, the methodology used to calculate the effluent discharge limits under the actual flow conditions resulted in a discharge that was considered protective of the environment.

A larger PCB exceedance, 95 and 120 ppb, occurred in WTS effluent samples collected on September 20 and 22, 1994, respectively (the daily limit was 0.5 ppb and the monthly limit was 0.1 ppb). These relatively high levels were attributed to the use of "Less Than 10" solvent to decontaminate the X*TRAX pad beginning on September 6, 1994. As a result of this exceedance, EPA required fish sampling and analysis for PCBs to take place in the Copicut River and in Cornell Pond prior to the implementation of the Management of Migration Remedy.

WTS effluent toxicity (bioassay) testing was conducted semi-annually with the first test conducted prior to the commencement of full-scale remediation. The testing consisted of a 48-hour acute toxicity test using the Daphnids Ceriadaphnia dubia and Daphnia pulex, and the Fathead Minnow Pimephales promelas, and a 7-day chronic toxicity test using Ceriadaphnia dubia and Pimephales promelas. As described in Section 3.0, the frequency of bioassay testing was increased from semi-annually to quarterly for the duration of the Source Control Remedy beginning in February 1994 as a condition of increasing the acetone discharge limit. In the April 1994 bioassay tests, two of the three test organisms failed to achieve the 48-hour acute action level. This was attributed to high concentrations of ammonia in the untreated X*TRAX aqueous condensate prior to the biological treatment system and in the nutrients added to the biological treatment system. The addition of nutrients to the biological treatment system was subsequently eliminated.

The next bioassay tests, performed in June and early July 1994, showed progressively more severe mortality. Since the nutrient feed was discontinued, the June and July ammonia concentrations in the condensate improved, but it was diluted with other water in the WTS to a much lesser degree than in previous months. Further compounding the problem, a pH control problem at the WTS during July resulted in a higher effluent pH than normal. More ammonia is present in solution at a higher pH. In order to minimize the ammonia concentration in the effluent discharged to the Copicut River, EPA required that the pH of the discharged effluent be kept below 8.0. A low discharge flow rate (35 to 50 gpm) was also maintained at this time. Subsequent bioassay tests passed the limits. Maintaining the effluent pH at or below 8.0 appeared to resolve the earlier problems. The bioassay test results did not indicate a detrimental effect on the environment.

Monitoring and control of VOC emissions from the vapor-phase carbon units of the WTS (to schedule carbon changeouts) was initially performed through daily portable photoionization detector (PID) readings of influent and effluent air, Sensydyne tube readings for vinyl chloride to confirm high PID effluent readings, and monthly Tedlar bag sampling and TO-14 (GC/MS) analyses. Problems involving high MicroTIP emissions readings that were not confirmed with the TO-14 or charcoal tube analyses, and apparent false positive readings on the Sensydyne tubes due to interferences, resulted in changes to the VOC emissions monitoring program as described in Section 4.3.1. WTS vapor-phase carbon units were changed according to the criteria listed in Appendix A of this document. One changeout occurred in the summer of 1993 and one in the summer of 1994.

The air emissions from the X*TRAX process vent were continuously monitored for total hydrocarbons (THC) using a flame ionization detector (FID) both before and after passing through a 1000-pound carbon adsorption vessel. The continuous THC readings were recorded on a strip chart recorder as well as manually logged to determine breakthrough of VOCs from the carbon system and schedule changeout of the carbon vessel. The total flow of the vent was also measured. The flow and THC concentration readings were used to determine the THC emission rate in pounds per hour. The carbon adsorber was replaced before the daily emission rate exceeded 0.38 lb/hr. The range of X*TRAX process vent emissions is shown on Table 3-4.

The emissions from the tank vent carbon adsorbers were monitored weekly with a portable organic vapor analyzer (OVA), which is an FID. Following startup of the biological treatment system in February 1994, the two original tank vent carbon adsorbers plus the bio-reactor carbon adsorber were monitored daily instead of weekly. The bio-reactor tank vent was also monitored daily with an LEL meter. The readings were recorded and were well below the limits described in Section 3.0 of this document. These tank vent readings were not considered an appreciable source of emissions.

3.3 Quality Assurance/Quality Control (QA/QC)

Several site Source Control Remedy documents provided the tools by which quality control was established and assured during the Remedy. These documents consisted of:

- Field Operations Support Plan, including a Quality Assurance Project Plan
- Implementation Plan
- Remedial Action Work Plan
- Final (100%) Design

TABLE 3-4
X*TRAX PROCESS VENT VOC EMISSIONS
(JUNE 1993 - JULY 1994)
RE-SOLVE, INC. SITE
NORTH DARTMOUTH, MASSACHUSETTS

Location	Performance Standard	Range of Readings	Average Reading
Process Vent	0.38 lb/hr	0.002 - 0.296	0.138 lb/hr

During implementation of the Source Control Remedy, RUST's site-based Project Quality Assurance Manager was responsible for implementation of the Quality Assurance Project Plan and overall project quality control.

EPA approved the use of ENSYS Immunoassay Test Kits to estimate PCB concentrations in soils. This screening technique was used by the RP contractor to obtain rapid (30-minute) estimated PCB concentrations in soil samples when needed to accelerate the work. Initially, data collected by the ENSYS technique were confirmed with laboratory analyses. The results indicated that the ENSYS data correlated 90 percent with the laboratory data and the other 10 percent showed higher concentrations than the laboratory data. The technique was found to have a false positive bias (which is reflected in the 10 percent with higher concentrations). Examples of cases where ENSYS was used are: intermediate bin ("clean" soil removed to access contaminated soil beneath it) samples, where the soil was assumed to be contaminated based upon the ENSYS result; and post-excavation samples, where the RP contractor continued excavating soil based upon the ENSYS result rather than waiting 24 hours for the off-site laboratory result. ENSYS was also used with the decontamination testing of equipment and concrete pad cores. The on-site use of the ENSYS screening technique was a valuable time-saving tool. However, it was not used for measuring compliance with performance standards.

EPA's Oversight Contractor, Halliburton NUS/Raytheon Engineers and Constructors, provided extensive oversight of Source Control remedial activities to ensure the Source Control Contractor's conformance with the approved Source Control Remedy documents. EPA also instituted a sampling program to confirm results of a representative number of samples taken by the Contractor. Split sampling at a rate of 10 to 20 percent was conducted by EPA to monitor the performance of the X*TRAX unit, the performance of the water treatment system, the excavation limits, and the handling of excavated intermediate soil. All EPA samples were analyzed using the Contract Laboratory Program (CLP). EPA split sample results were comparable to the Contractor's results; as a result, treated soil split sampling frequency was reduced to 10 from 20 percent after approximately six months. At about the same time, the analytical method used to analyze split soil samples for PCBs was changed from the Routine Analytical Service (RAS) method to the quick turnaround method (QTM). Several samples initially were split between the RAS and QTM methods to prove the efficacy of the QTM method. The regular RAS method turnaround time was about one month while the turnaround time for the QTM method was 48 hours. Since the Contractor obtained PCB results in 24 hours, EPA analyses were changed to the QTM method to allow timely comparisons between RP and EPA results before action was taken on the treated soil or excavation area.

3.4 Summary

The results of sampling verified that the excavation of soil and sediment, treatment of soil, discharge of treated water, and X*TRAX VOC emissions (see Tables 3-1 to 3-4) met the requirements of the ROD and Consent Decree. Based on monitoring inspections, the wetland restoration is expected to meet the requirements of the ROD and Consent Decree. The results of air sampling verified that the Site emissions caused no potential health impacts at or beyond the perimeter of the Site.

4.0 CONSTRUCTION ACTIVITIES

ENSR Consulting and Engineering serves as the Project Coordinator for the Re-Solve Site Group. RUST Remedial Services Inc. (RUST) (formerly Chemical Waste Management, Inc.) was the primary Source Control Remedy contractor. In addition, RRS used a variety of subcontractors to execute the work, including Coastal Environmental Services, Inc. of Princeton, New Jersey for the wetlands restoration portion. The Halliburton NUS/Raytheon Engineers and Constructors (formerly Badger Engineers, Inc.) team served as EPA's oversight contractor. Raytheon provided the bulk of the oversight with Halliburton NUS providing analytical laboratory coordination, data validation, and oversight of the wetlands restoration. The Massachusetts Department of Environmental Protection (MADEP) ensured substantive compliance with state requirements. The U.S. Fish and Wildlife Service participated in the wetlands restoration.

At the conclusion of the project, EPA's Remedial Project Manager prepared a document "Lessons Learned from the Low Thermal Desorption Source Control Remedy at the ReSolve, Inc., Superfund Site, North Dartmouth, MA". In May 1995, this document was presented at the National Academy of Remedial Project Managers (NARPM) in San Francisco, CA (see Appendix E). The document provides valuable insight and lessons learned from the low thermal desorption treatment process which could be applied to other low thermal desorption remedial action sites. Some of the materials in the document were incorporated into Section 4.0 of this document.

4.1 Excavation

Excavation of PCB-contaminated soils was performed according to excavation maps showing the depth and lateral limits of excavation, which were generated based on the results of soil sampling and geostatistical analysis. The upland area was referred to as the Waste Management Area (WMA). Since the Site is small (6 acres) and most of it needed to be excavated (approximately 4.5 acres), coordination of excavation, treatment, stockpiling, and backfilling operations was challenging. All on-site activities had to be coordinated well in advance. In order to provide room for the on-site X*TRAX unit and wastewater treatment system (WTS), the soils underneath their foundations or pads were excavated prior to their construction. This excavation was completed during pilot test operations in May-June 1992. As part of the pilot tests, approximately 175 cubic yards of soil were treated; the balance was stockpiled onsite until full-scale operations commenced in 1993.

Sheet piling was installed along the borders of some of the excavation phase areas to provide protection against groundwater intrusion and to maintain slope stability. The piling, except for that surrounding the X*TRAX pad which will be used during the Management of Migration (MOM) remediation phase, was extracted, decontaminated, and removed from the Site during the Source Control demobilization. In those areas adjacent to the WTS pad and X*TRAX pad where the excavation was expected to extend below the bottom of the slab, 10 foot by 20 foot trench boxes were used. A system of dewatering wellpoints was installed around excavation areas to prevent groundwater intrusion when the bottom of the excavation was lower than the existing groundwater table. The extracted groundwater was treated in the on-site WTS.

During dry periods, water sprays were used on Site roads and excavation areas to reduce dust emissions.

4.1.1 Oversized Material Handling

Prior to treatment in the X*TRAX unit, contaminated soil passed through a vibratory screener to separate those materials that were one inch or less in diameter from those greater than one inch. This operation was required to ensure that the soil passing through the X*TRAX unit was small enough to be treated without causing a unit malfunction. Residual soils on rocks that were greater than one inch in diameter ("oversized material") were to be removed by rescreening or brushing prior to backfilling. However, initial attempts to remove the visible soils on oversized material by rescreening or brushing were unsuccessful. An alternative procedure was developed for removing the residual soil from rocks by washing with water in a large metal tub basin. All residual soils were treated through X*TRAX, while the tub water was treated through the WTS. All debris (metal, plastic, wood, etc.) was also removed from the oversized material and disposed of off-site as hazardous waste. The oversized materials were analyzed and found to be well below the established PCB clean-up standard of 25 ppm. Therefore, all washed oversized materials were backfilled on site.

4.1.2 Surface Water Control

The contractor's lack of complete adherence to the surface water control plan became a problem in the wake of heavy winter storms. The Implementation Plan called for controlling surface water run-on into the active excavation areas using silt fences, earthen berms, or railroad ties placed around the open area. This was not done consistently, leading to the collapse of contaminated slopes into "clean" areas during a storm event. Some material from the contaminated soil pile also eroded into "clean" areas. Areas of commingled contaminated and clean soil were re-excavated and re-sampled to ensure that all contaminated soil had been removed. As a result, checking and maintenance of silt fences around open excavation areas were emphasized as high priority items for the remainder of the project.

4.1.3 Posi-Shell Cover for the Contaminated Soil Piles

RUST requested, and EPA granted, approval to use "Posi-Shell" material as an alternative pile cover material in place of polyethylene sheeting and geotextile material. Posi-Shell consists of a mixture of water, Posi-Pak (a mixture of recycled plastic and cellulose fibers), and a mineral binder (cement kiln dust). After spray application, the Posi-Shell slurry hardens to a non-flammable coating that resists rain and erosion and minimizes dust and odor problems. Posi-Shell is commonly used as a municipal landfill daily cover. The Posi-Shell system offered the following advantages over the use of polyethylene sheeting or geotextile fabric covers:

- Possible improved performance in control of dust and organic vapor emissions because a large portion of the pile needs to be uncovered when using a pile with a fabric cover.

- As the Posi-Shell material is water resistant, contact of rain with contaminated soil can be reduced, resulting in reduced moisture content of the soil to be thermally treated, which consequently increased the treatment rate.

- Reduced costs by reducing the amount of labor required to cover and uncover piles daily.

Posi-Shell was also used occasionally in the excavation to control organic vapor emissions.

4.1.4 DNAPL Wellpoint

Dense non-aqueous phase liquid (DNAPL) was discovered in a wellpoint located south of the X*TRAX pad in December 1993. It has been bailed or pumped periodically to remove the DNAPL. From December 1993 through August 1994, 8.6 gallons were recovered by hand bailing. In September 1994, an automatic pump was placed at the wellpoint to remove the DNAPL. In October 1994, DNAPL was removed at a rate of approximately 23 gallons per month; decreasing to 6 gallons in November 1994. During 1995 the DNAPL volume recovered has ranged from a high of 2.4 gallons in March to a low of 0.3 gallons in July. A total of 55.7 gallons of DNAPL were removed during the period from October 1994 to September 1995. The pump was replaced in early 1995 and again in August 1995, due to corrosion from DNAPL. The presence of DNAPL is being addressed in the Management of Migration Remedy design.

4.2 X*TRAX System

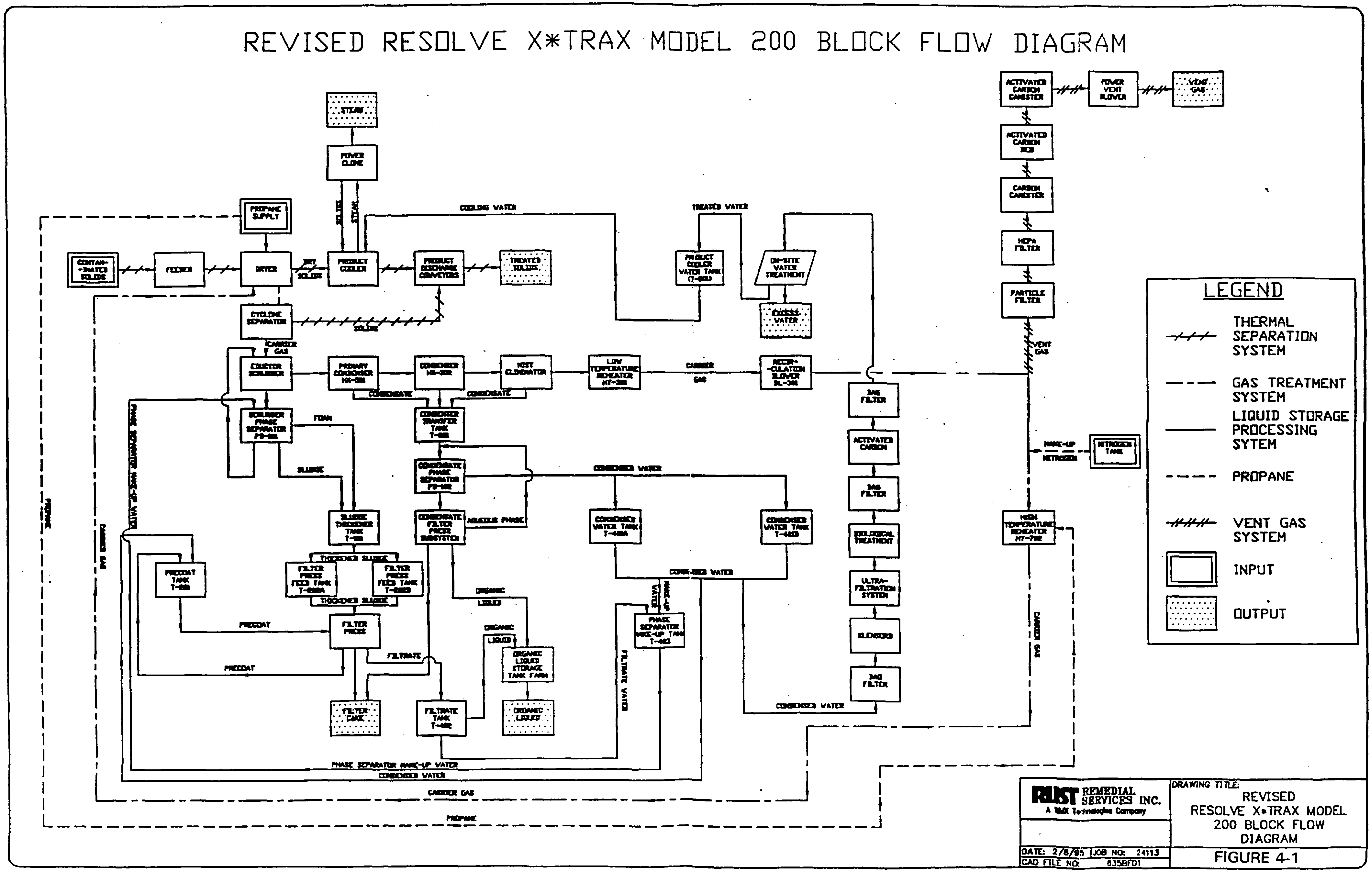
The RD/RA SOW required full-scale pilot demonstrations for the X*TRAX and DECHLOR treatment processes, which were conducted in May and June of 1992. The results of the pilot testing indicated that the dechlorination technology is implementable at Re-Solve. The full-scale dechlorination treatment system, which consists of two main process units: X*TRAX (thermal desorption unit) and DECHLOR (PCB liquid dechlorination unit), successfully achieved all remedial action objectives (e.g., 25 ppm PCB clean-up level for soils) that were defined in the ROD. Despite the pilot test's successful demonstration of achievement of the ROD's remedial action objectives, the Source Control Pre-Design Report recommended modifications to the full-scale dechlorination treatment system so that the full-scale remediation could be conducted in the most cost-effective, most technologically effective, and most environmentally safe manner.

Although the DECHLOR process was proven to be successful in the treatment of concentrated PCB-contaminated oil generated by X*TRAX during the pilot demonstration, its use during the full-scale remediation was not cost-effective and economically feasible. The primary reason was the increase in the volume of process residuals due to the reagents used in the DECHLOR process. Therefore, EPA made a determination that the DECHLOR be decoupled from the full-scale dechlorination treatment system. This decoupling would reduce costs not only from off-site disposal of a reduced volume of waste generated but also from the elimination of the need to operate the DECHLOR while still achieving all remedial action objectives. Decoupling of the DECHLOR process was also consistent with EPA waste minimization policy. Without the DECHLOR, the concentrated PCB-contaminated oil generated by the X*TRAX was sent directly to an off-site TSCA-permitted incinerator. This change was documented in an Explanation of Significant Differences issued by EPA on June 11, 1993.

Therefore, for full-scale on-site remediation of PCB-contaminated soils and sediments, X*TRAX technology alone was employed.

The X*TRAX system was used to remediate the Site by thermally desorbing the PCBs from the excavated soil and sediment. In this system, soils with organic contamination are heated in an inert atmosphere, driving off the water and organic contaminants and leaving the dry solids behind. The rotary dryer (thermal separator) produces decontaminated soil and off-gases. The off-gases were condensed into a liquid condensate, while the remaining light organic gases (methanes, etc.) were treated through vapor-phase carbon and released to the atmosphere. The water in the liquid condensate was removed through phase separators, creating two streams: water condensate and organic condensate. The recovered organic condensate was shipped for off-site disposal at a TSCA-permitted incinerator. The recovered water condensate was initially used directly for product cooling (quenching), but later all of the water condensate was treated in the on-site wastewater treatment system (WTS). As a result, WTS-treated water was used for product cooling. Figure 4-1 shows a block flow diagram of the X*TRAX components. Several modifications were made during the full-scale remediation under EPA approval. These modifications are described below.

Full-scale operation of X*TRAX commenced on June 21, 1993 and was completed on July 19, 1994. A total of approximately 36,000 cubic yards of PCB-contaminated soils were excavated and treated by the X*TRAX unit. Approximately 1,500 cubic yards of PCB-contaminated sediments were excavated and backfilled on site. Out of the total amount of sediments excavated, 210 cubic yards contained PCBs greater than 25 ppm, which required treatment through the X*TRAX process. As stated in Section 3.0, the PCB cleanup levels of 25 ppm in soil and 1 ppm in sediment were achieved. The average X*TRAX treated soil PCB concentration was 2.8 ppm (well below the required 25 ppm standard).


REVISED RESOLVE X*TRAX MODEL 200 BLOCK FLOW DIAGRAM
LEGEND
THERMAL SEPARATION SYSTEM
GAS TREATMENT SYSTEM
LIQUID STORAGE PROCESSING SYTEM
PROPANE
VENT GAS SYSTEM
INPUT
OUTPUT
STEAM
POWER CLONE
PROPANE SUPPLY
FEEDER
DRYER
PRODUCT COOLER
PRODUCT DISCHARGE CONVEYORS
TREATED SOLIDS
CYCLONE SEPARATOR
COOLING WATER
TREATED WATER
ON-SITE WATER TREATMENT
EXCESS WATER
ACTIVATED CARBON CANISTER
POWER VENT BLOWER
VENT GAS
ACTIVATED CARBON BED
CARBON CANISTER
HEPA FILTER
PARTICLE FILTER
CARRIER GAS
BAG FILTER
ACTIVATED CARBON
BIOLOGICAL TREATMENT
NITROGEN TANK
MAKE-UP NITROGEN
CONDENSED WATER
CONDENSATE
THICKENED SLUDGE
SLUDGE
FILTER PRESS
FILTER CAKE
PRECOAT
FILTRATE
FILTRATE WATER
ORGANIC LIQUID
ORGANIC LIQUID STORAGE TANK FARM
AQUEOUS PHASE
PHASE SEPARATOR MAKE-UP WATER
PROPANE
RUST REMEDIAL SERVICES INC.
DRAWING TITLE:
REVISED RESOLVE X*TRAX MODEL 200 BLOCK FLOW DIAGRAM
DATE: 2/8/95
JOB NO: 24113
CAD FILE NO: 835BFD1
FIGURE 4-1

4.2.1 Replacement Product Conveyors

During the pilot demonstration, the treated soil discharged from the X*TRAX dryer was conveyed to a double flap valve and product cooler using two inclined screw conveyors. The screw conveyors required excessive maintenance during the pilot demonstration. For the full-scale remediation, the screw conveyors were replaced with vibratory V-trough conveyors, which were completely enclosed units designed to be dust and gas tight. The transitions (boots) from the dryer to the double flap valve were made of a steel-reinforced, temperature-resistant fabric that was also dust and gas tight. However, failure of the transition boots connecting the product discharge conveyors began approximately one hour into the operation on June 21, 1993 and boot failures continued to be a problem throughout the month. Transition boot failures and repairs caused frequent shutdowns of the X*TRAX system.

Occasional boot failures were caused by the vibratory motion of the discharge conveyor apparatus, which tended to loosen the boot clamps, which then caused dust releases. Catastrophic boot failures were also caused by tearing of the boot material (silicone rubber). Another significant problem with the discharge conveyors was that extremely fine material encountered problems flowing through the conveyors and then blocked the flow of all treated soil.

New springs were installed on the discharge conveyors to reduce vibrations, but this did not solve the problem. (The boot manufacturer's representative had visited the site and stated that the amplitude of vibration was too great.) Boots of different materials, including Kevlar, were installed but continued to fail. Discharge conveyor boot failures (and resulting dust releases) continued until the new discharge configuration (without boots) was completed on July 17, 1993. The new configuration involved cooling and quenching the material immediately upon exiting the dryer, then conveying the material using standard conveying techniques (belt conveyor). The conveyor belts were fitted with non-airtight covers to reduce dust emissions from the treated soil.

4.2.2 Dust Releases

Once the conveyor problem had been solved, a new problem with the product cooler developed: The dryer was now cooling and dedusting the solids at their highest temperature, and thus generated a higher volume of dust in the product cooler's stack steam plume. As a result, a series of water sprays, chevron packings, mesh pads, and a powered cyclone (powerclone) were added to the vent stack. The water sprays, chevron packings, and mesh pads acted as a wet scrubber removing the larger dust particles from the steam. The fine dust particles were removed by the powerclone. A high pressure pump installed in the powerclone allowed more water to be sprayed when processing high soil throughputs. These modifications successfully removed dust efficiently from the steam plume.

Occasional short-term dust releases were caused by insufficient mixing of water with soil due to product cooler paddle wear as well as by insufficient volume of water fed into the powerclone. These releases were quickly noticed and corrected.

4.2.3 Organics in Wastewater Stream

During full-scale operation, two problems were noted with the condensate treatment system. First, the initial phase separator did not provide a good separation of the components of the liquid condensate stream. The carryover of organics and particulates in the water condensate resulted in a need for frequent changes of the carbon beds. Consequently, it was necessary to implement additional liquid condensate treatment procedures to obtain a better separation of the condensate phases. Klensorb (an organophillic clay filter) was added to the treatment process, but did not achieve adequate separation and required frequent changes. After reviewing several alternatives, such as filter pressing, centrifugation, etc., a cross-flow membrane filtration system was installed and became operational on December 17, 1993. The system had frequent problems with fouling of the membranes, resulting in its removal from operation in May 1993.

Early in the full-scale operation, some high organic and particulate concentrations were detected in the water condensate. As a consequence, beginning in September 1993, all water condensate from X*TRAX was transferred to the WTS for treatment. This resulted in the second problem: concentrations of acetone in the WTS effluent higher than the discharge limit. Since acetone is not efficiently removed by air stripping or carbon, the two main treatment processes used at the WTS, much of the acetone remained in the effluent. An aerobic biological fixed film aqueous treatment system was installed to remove acetone from the X*TRAX condensate and was operational on February 17, 1994. The system successfully treated the condensate to attain acetone discharge limits at the WTS.

The tank head space of the bio-reactor was vented through carbon. When the bio-reactor was installed, EPA required that monitoring of the emissions from all of the tank vent carbon adsorbers be increased from weekly to daily for the duration of the project.

4.2.4 X*TRAX Emergency Situations

Prior to full-scale remediation, the Source Control contractor had developed an emergency response table to assist the operators in coping with equipment failure and emergency situations. However, because of the frequent X*TRAX shutdowns at the outset of full-scale remediation, EPA became concerned that without a definitive procedure for handling, testing and possibly retreating soils, the discharge of partially treated soil could occur under certain circumstances. As a result, the Source Control Contractor developed a procedure to be followed in the event that untreated or partially treated soil must be discharged from the dryer due to a mechanical breakdown or other malfunction of the X*TRAX system. This procedure is included in Appendix C of this document.

4.3 Wastewater Treatment System

A wastewater treatment system (WTS) was constructed on site to process groundwater removed during the dewatering operations associated with excavation, surface water from storm events, decontamination water, and excess water condensate generated by the X*TRAX system. The WTS consisted of the following treatment units: oxidation using potassium permanganate, flocculation/sedimentation, greensand filtration, sludge filter pressing, air stripping, liquid-phase carbon adsorption, and vapor-phase carbon adsorption.

The full-scale WTS, designed for a maximum flow rate of 150 gpm, was pilot tested in January and February 1992, operating at continuous flow rates from 100 up to 120 gpm. During pilot operations, the WTS operated within the effluent discharge limitations set forth in the Wastewater Treatment System Permit Equivalency Submittal, except for one anomalous result; it was determined that this result was probably due to contamination of the sample during sampling or laboratory analysis.

The WTS operated sporadically prior to full-scale operation of X*TRAX. During full-scale operation of X*TRAX, the WTS was operated usually on a regular basis, except during periods of little precipitation. As shown in Section 3.0, following the pilot test the treated effluent generally fell within the effluent discharge limitations set forth in the Wastewater Treatment System Permit Equivalency Submittal.

4.3.1 Control of WTS Air Emissions

Monitoring and control of VOC emissions from the vapor-phase carbon units of the WTS was initially performed daily through portable photoionization detector (PID) readings of influent and effluent air, Sensydyne tube readings for vinyl chloride to confirm high PID effluent readings, and monthly Tedlar bag sampling and TO-14 (GC/MS) analyses. The monitoring program was changed due to problems encountered measuring total VOCs with a PID and measuring vinyl chloride with a Sensydyne tube. The following method changes were made to this monitoring program:

- All PID and OVA readings were made on samples collected in a Tedlar bag to remove the false high reading effect of positive pressure in the sample ports.
- All elevated PID readings were confirmed using an OVA to remove the possible false reading effect of high moisture content on PID readings.
- The use of Sensydyne tubes to measure vinyl chloride was replaced with charcoal tubes using NIOSH Method 1007 because of interferences by other chlorinated compounds in the Sensydyne tubes.

4.4 Neighbor Relations

The Re-Solve Site is located in a rural residential area. Issues that became important to the Site's neighbors during the Source Control remedial action were noise, dust and odors from the Site, and traffic control.

Since the X*TRAX system operated 24 hours per day, heavy equipment was operated throughout the day for soil excavation, preparation, and feeding activities, and during the night for feeding the soil to the unit. Soil excavation and preparation activities were not performed at night. Because of neighbor complaints, the reverse warning beepers on the heavy equipment feeding soil to the unit were replaced with lights at night. A loud knocking device was also removed from the dryer. All off-Site trucks were prohibited from making deliveries between 7:00 p.m. and 7:00 a.m. to reduce noise levels during the evening hours. Neighbors sometimes made use of a 24-hour Site telephone number to register complaints.

As a result of neighbor complaints of occasional odors, Health and Safety (H&S) personnel included the adjacent North Hixville Road and a neighbor's backyard in their VOC and dust monitoring rounds. When a neighbor complained of odors or dust, on-site H&S personnel checked VOC and dust levels with portable instruments. However, the neighbors often complained of odors or dust several days after the event. While H&S checks were performed in these cases, they were inconclusive. In an effort to keep the public informed of Site emissions, RUST posted the daily perimeter monitoring readings on a board at the nearby firehouse beginning in early Spring 1994. RUST also prepared and mailed several monthly progress reports of Site activities to the neighbors and town officials. RUST offered to house the adjacent neighbors in a hotel any time they felt uncomfortable with odors during excavation activities near their homes.

The Re-Solve Site is located on North Hixville Road, a small two-lane rural road. Trucks and trailers visited the Site on an almost daily basis for various deliveries and pickups. Due to the narrow road and entrance to the Site, large vehicles usually encountered problems entering and exiting the Site, requiring the road to be blocked for short periods of time. Neighbors complained occasionally of truck traffic blocking the road, citing concern for passage of emergency vehicles. The greatest number of complaints occurred during the move of Support Zone trailers from the south to the north side of the Site; this caused the lengthiest traffic blockages. The average length of time the road was blocked, however, was a few minutes, and the Contractor always had a local police officer to direct traffic.

EPA held two public meetings with the community during the Source Control remedial action, and occasionally discussed issues one-on-one with the local residents.

5.0 FINAL INSPECTION

EPA, Massachusetts Department of Environmental Protection (MADEP), and the oversight contractor (Raytheon) conducted a Source Control closeout Site walk over on December 14, 1994 to inspect the completion of the Source Control remediation. Specifically, this included inspections of the site grading and crushed stone cover, Waste Management Area (WMA) fence, WMA side slopes into surrounding wetlands or adjacent properties, and long-term site security. Topographic plans showing the finish Site grades are included following Section 8.0 of this document. As a result of the Site walk over, a list of items to be addressed for Site closeout was developed. EPA's December 19, 1994 letter describing these items is included in Appendix D of this document.

On May 2, 1995, EPA, MADEP, Raytheon, and the RP contractors (RUST and ENSR) conducted another Site walk over to evaluate the wetlands hydrology and check on the status of the Source Control Site closeout items. Several action items identified during the May 2, 1995 visit were completed prior to the June 21, 1995 Source Control Closeout Issues inspection.

On June 21, 1995, EPA, MADEP, Raytheon, RUST, ENSR, and members of the ReSolve Site Group conducted a final Source Control Closeout Issues inspection. It was agreed during this inspection that all closeout issues relating to the demobilization of the Site had been addressed and required no further action. Any issues that were not resolved will be addressed as part of the Wetland Monitoring Inspections or the Long Term Operation and Maintenance Inspections. Closeout issues requiring no further action included: the gates and fence repairs; seeding; and removal of general site debris and crushed stone in the western portion of the North Wetland. Issues to be addressed as part of future inspections include: inspecting seeded areas; removing hay bales; monitoring the impact of ponded water and crushed stone in the eastern portion of the North Wetland; and monitoring the area of exposed crushed stone in the GAP area between the ponded area of the North Wetland and Waste Management Area that was covered with soil and erosion control fabric. RUST's July 12, 1995 letter describing these items is included in Appendix D of this document.

6.0 CERTIFICATION THAT REMEDY IS OPERATIONAL AND FUNCTIONAL

The Source Control Remedy included excavation and on-site treatment of contaminated soil and sediment located above the seasonal groundwater low (SGL) elevation, backfilling treated soil, placement of a gravel cover, and wetland restoration. Post-excavation soil sampling showed that all contaminated soil above SGL and above the cleanup level of 25 ppm of PCBs was removed. Pre-excavation and post-excavation sediment sampling showed that all contaminated sediment in the wetlands above SGL and above the cleanup level of 1 ppm of PCBs was removed. All excavated soil and sediment with a PCB concentration greater than 25 ppm was successfully treated below 25 ppm through the on-site X*TRAX system. After testing showed that soils contained less than 25 ppm of PCBs, all treated soil and sediment were backfilled on site in the upland area (WMA). An 18-inch gravel cover was placed over the WMA; site surveys confirmed the depth of the cover and grading contours. The north and east wetlands were restored according to the approved Wetland Restoration Plan. Future wetland inspections will ensure the continued success of the wetland restoration.

7.0 OPERATION AND MAINTENANCE

After completion of the excavation, treatment, and backfilling activities, the equipment used during the Source Control Remedy (SCR) was decontaminated and demobilized from the Site. All Site structures were removed, except for the X*TRAX concrete foundation, which will be used to support the groundwater treatment system to be constructed under the Management of Migration (MOM) Remedy.

On June 21, 1995, EPA, MADEP, Raytheon, RUST, ENSR, and others conducted three inspections covering wetland monitoring, closeout issues, and long-term operation and maintenance. It was agreed that all outstanding closeout issues will become part of the long-term operation and maintenance inspections.

Long term operation and maintenance of the SCR consists of the following:

- Visual inspections for settling, subsidence, erosion, runoff, or other adverse effects on the cover, the benchmarks, or the perimeter fencing at 6-month intervals for up to two years following completion of the SCR site demobilization, by which time it is anticipated that the MOM operations will have begun. Defective areas will be repaired as required. If the benchmarks are disturbed, they will be reset as necessary. The fencing and warning signs will be repaired as necessary.

- Annual surface water monitoring of the Copicut River for PCBs for up to two years following completion of the SCR site demobilization, by which time it is anticipated that the MOM operations will have begun. The first such sampling round took place in December 1994. PCBs were not detected in the samples.

Similar inspections and surface water monitoring may be addressed in MOM submittals and may supercede these long-term operation and maintenance requirements.

8.0 SUMMARY OF PROJECT COSTS

EPA and the Commonwealth of Massachusetts met with the Potentially Responsible Parties (PRPs) several times between June of 1983 and September of 1987, when the second ROD was issued. Those discussions did not lead to any agreements between the Government and PRPs. After the second ROD was signed, the Region decided to negotiate with the PRPs to conduct the remedial action under the CERCLA §122 Special Notice procedures. Region I determined that preparation of a Nonbinding Preliminary Allocation of Responsibility ("NBAR") would promote expedited settlement with the PRPs, and therefore prepared an NBAR which allocated 15 percent total liability to PCB generators and apportioned the remainder of the liability to the non-PCB generators proportionate to their volumetric contributions.

In March of 1988, Special Notice letters were issued to approximately 320 previously identified PRPs. In July, the Governments and generator PRPs reached agreement in principle. On May 31, 1989, a Consent Decree was entered which resolved the liability of 224 generator parties who contributed hazardous substances to the Site. Under the terms of the Consent Decree, the United States recovered $8.1 million in costs, including interest.

Of the 225 parties that settled, 169 were de minimis parties that paid $2.7 million toward past cost reimbursement, and an additional $7.8 million to the Re-Solve Trust Fund as their share of the cleanup costs. In addition, the 56 non-de minimis parties (those that contributed more than 1 percent of the hazardous substance at the Site) agreed to perform the remedy which was estimated to cost $29.8 million. In return for these parties performing the remedy, the United States agreed to fund up to $6.9 million of the costs of the remedy under a mixed-funding agreement authorized by Section 122(b) of CERCLA.

In September of 1989 the United States entered into two administrative settlements with additional generator parties. The first administrative settlement was a de minimis settlement under CERCLA §122(g)(1)(A), whereby the United States recovered approximately $3.8 million from 169 parties. The second administrative settlement was a non-de minimis settlement under CERCLA §122(h)(1), whereby the United States recovered approximately $1.7 million from one generator party.

In March of 1990, the United States filed a CERCLA §107 cost recovery action in the U.S. District Court for the District of Massachusetts naming nineteen parties that did not settle in previous settlements (U.S. v. Re-Solve, Inc. et al.) The United States separated that group of nineteen non-settlers into several subgroups for purposes of settlement.

A settlement with eight defendants, based on ability to pay, was entered by consent decree on October 27, 1992. The eight settlers agreed to pay the United States $1,145,000. In another settlement by consent decree, entered on December 23, 1992, four small-volume generators agreed to pay a total of $330,000 to the United States. Though small in overall dollar amount, this settlement is significant in that the defendants paid a higher per drum amount than those defendants who settled earlier, thereby maintaining the important principle of escalating payments for later settlements.

The government has also settled with Universal Products, a generator, for $15,000 and William Jackson, the owner/operator of the site, for $400,000. The consent decree concerning that settlement was entered by court on February 17, 1994.

An order granting partial summary judgement for liability against the only two remaining non-settlers, Vulcan International Corp. and Nyco, Inc., was signed on August 2, 1995.

Overall, the government has been overwhelmingly successful at recovering costs, obtaining agreements from the non-de minimis settlers to perform the remedy, and reaching settlements with parties.

Payments to the Re-Solve Site Group's contractor (RUST Remedial Services, Inc.) for implementation of the Source Control Remedy totalled approximately $19,190,000. This cost includes treatment of 44,400 tons of soil/sediments, or approximately 36,000 cubic yards, through the patented X*TRAX™ thermal desorption process. The actual cost of the Source Control Remedy includes the following ancillary activities: full scale pilot study, remedial design documents, mobilization, on-site dewatering, installation and operation of an on-site water treatment system, excavation of site soils and sediments, post-excavation sampling, treated soil sampling, backfilling (with treated soils) and grading of the site, X*TRAX process monitoring, perimeter air monitoring, wetlands restoration, final grading, installation of an 18-inch gravel cap, demobilization, and site fencing.

The actual cost to implement the Source Control Remedy on a per ton treated soil basis, including the above-mentioned ancillary activities, was approximately $432/ton. The cost for treatment alone through the X*TRAX process has been estimated by RUST Remedial Services, Inc. at $155/ton. This estimate includes the following cost categories directly associated with the X*TRAX technology: site preparation and mobilization of the unit; capital equipment; startup; labor; consumable materials; utilities; residual and waste handling associated with the unit, transportation and disposal; maintenance and modification; and demobilization of the unit. The cost per ton for treatment varies on a sliding scale, decreasing with treatment of increasing volumes of contaminated soil. The cost per ton also varies based on the soil treatment rate, decreasing as the ton per hour rate increases. These costs are not presented in this document; all the costs presented in this document are overall averages.

The 1987 ROD specified treatment using a dechlorination technology at an estimated cost of $9,237,000 for excavation and treatment of 25,500 cubic yards of PCB-contaminated soil and sediments (including capital and operation and maintenance costs). As summarized in Section 4.0 of this document, a number of changes were implemented during the Source Control Remedy, many of which resulted in cost impacts unforseen at the time the 1987 ROD was completed. Significant changes include a greater volume of soil excavated and treated (an additional 10,500 cubic yards), full-scale pilot studies, dewatering and installation, operation and monitoring of the water treatment system. The Re-Solve Site Group considers the 1987 ROD's cost estimate for the Source Control Remedy to be low. The low bid received by the Group in 1989 for implementation of the ROD-specified Remedy was approximately $15,000,000 for 25,500 cubic yards of soil.

To better compare the 1987 ROD's estimated cost ($9,237,000) to the actual 1994 Source Control cost ($19,190,000), it is necessary to convert the 1987 ROD's estimated cost to a 1994 present worth value. Using an average 4.0 percent annual interest rate over the intervening seven years yields a 1994 present worth value of $12,155,000. Accounting for the volume differences (25,500 cubic yards in the 1987 estimate versus the actual volume of 36,000 cubic yards) proportionally yields an adjusted 1994 present worth cost of $17,160,000. Therefore, considering that the cost increases associated with dewatering, the water treatment system and the full-scale pilot studies were not factored into the 1987 ROD's estimated cost, the actual cost of $19,190,000 for the Source Control Remedy compares well to the estimated 1994 present worth cost of $17,160,000.

APPENDIX A

WATER TREATMENT SYSTEM AIR MONITORING PARAMETERS
(ATTACHMENT TO A RUST LETTER DATED OCTOBER 27, 1993)

Water Treatment System Air Monitoring Parameters

Comparison of Requirements of 100% Design, Revision 1 and Field Operations Support Plan, Revision 2 with Proposed Sampling Methods and Corrective Actions

Universal Change

All PID and OVA readings will be collected in a Tedlar bag to remove the effect of positive pressure in the effluent lines.

Primary GAC units monitoring with PID

100% Design, Rev 1, Section 3.5 - monitor daily with PID. If value of effluent from either primary is >80% of influent for 3 consecutive readings change that primary unit

FOSP, Rev 2, Table 2-1a and Section 3.4.2 - same as above

Proposed - similar to above, except elevated PID results will be confirmed using an OVA.

Primary GAC units effluent monitoring with Tedlar bags

100% Design, Rev 1, Section 3.5 - not required

FOSP, Rev 2, Table 2-1a and Section 3.4.2 - 30 minute grab monthly, analyze by method T0-14 modified. No action levels specified, compare to 8 hour TLV limits.

Proposed - not required, may be performed as an investigative measure if monthly test of secondary unit's discharge shows elevated levels of target compounds. Advisory emissions limits are applicable to the emissions from the secondary units and testing of these units by method T0-14 will continue.

Secondary GAC units monitoring with PID

100% Design, Rev 1, Section 3.5 - monitor combined effluent daily with PID. If value of effluent is >20% of influent to primaries for 3 consecutive readings notify ENSR and EPA to discuss possible actions. No mention of vinyl chloride monitoring.

FOSP, Rev 2, Table 2-1a and Section 3.4.2 - similar to above for >20% criterion, except that the 3 consecutive days portion was inadvertently omitted and the corrective action is to change the GAC units. In addition, the FOSP added a criterion that a test for vinyl chloride will be performed, as described below, if the effluent of the secondaries is >10% of the influent to the primaries and is

>5 ppm.

Proposed - monitor combined effluent daily with PID, confirm readings over 5 ppm with OVA, since PID has proven susceptible to false positives, especially at low concentrations. If value of effluent is >20% of influent to primaries and is >5 ppm on both PID and OVA for 3 consecutive days change secondary carbon units. If value of effluent is >10% of influent to primaries and is >5 ppm on both PID and OVA on any day then test for vinyl chloride as proposed below.

Secondary GAC units monitoring for vinyl chloride

100% Design, Rev 1, Section 3.5 - not required

FOSP, Rev 2, Table 2-1a and Section 3.4.2 - when required due to PID results, see above. Test using Sensydyne detector tube calibrated for vinyl chloride (0.2 to 4.0 ppm). Change GAC units if vinyl chloride detected.

Proposed - when required due to PID/OVA results, see proposed criteria above. Test using charcoal tube analyzed by NIOSH method 1007. Change GAC units if vinyl chloride concentration exceeds 1.0 ppm in sampled air.

Secondary GAC units monitoring with Tedlar bags

100% Design, Rev 1, Section 3.5 - 30 minute grab monthly, analyze by method T0-14 modified. No action levels specified, compare to 8 hour TLV limits.

FOSP, Rev 2, Table 2-1a and Section 3.4.2 - same as above

Proposed - same as above, no change

APPENDIX B

RUST LETTER DATED DECEMBER 21, 1993
(PERIMETER AIR MONITORING ACTIVITIES - DECEMBER 1-17),
AND CORRECTIVE ACTION PLAN FOR PERIMETER MONITORING
ACTION LEVELS AND RESPONSE PROGRAM

RUST REMEDIAL SERVICES INC.

3220 Tillman Drive Suite 200
Bensalem PA 19020 2028
Tel (215) 245 8100
Fax (215) 245 [illegible]

December 21, 1993 RRS Document No: 492935-930356

Mr. Michael Worthy
ENSR Consulting & Engineering
35 Nagog Park
Acton, MA 01720

Project : ReSolve Site, N. Dartmouth, MA, RRS Project No. 492935
Re : Perimeter Air Monitoring Activities - December 1-17
Letter No.: GWD-ENSR-174

Dear Mike,

This is to provide you with an update on activities and changes related to the ReSolve Site perimeter air monitoring system between the December 1, 1993 progress meeting and December 17, 1993.

SERVICE CALL BY ORR SAFETY

On December 6 and 7, a representative of Orr Safety (the vendor of the system) visited the site to inspect the entire system. Based on discussions with site personnel, he identified a possible problem with low voltage to the monitoring station PIDs (Microtips). The PIDs operate on a nominal 12 volt DC power source which is supplied by a 120 volt AC to 12 volt DC converter in each station. Each station also has a backup 12 volt DC battery system which provides power in the event of a loss of AC power. The service representative found that an internal wire in the Microtips appeared to be undersized, causing a voltage drop that resulted in the Microtip's electronics seeing a voltage of less than 11 volts under some circumstances. He replaced these wires with larger ones, raising the voltage to over 11 volts. Based on experience with the hand-held units, the low voltage could have caused false high readings, as the hand-held units output does drift up as their batteries run low.

The Orr service representative also replaced the Telog data logger boards in all of the perimeter stations with new ones. The old ones are being returned to the manufacturer for servicing and recalibration. It was noted that even some of the new boards will occasionally indicate an input signal voltage of 1 mV (millivolt), even when nothing is connected to the input terminals. Telog has informed us that this is not unusual and is related to the lower limit of resolution for the recorder's analog to digital converter circuitry (10 bit resolution). When using the full input signal range of 0-1 volt (0-1,000 millivolts) to represent a PID reading of 0-200 ppm organics, this 1 mV error results in the 0.2 ppm "offset" which we have observed on many occasions. This 0.2 ppm offset is equal to 40% of the 8-hour average limit of 0.5 ppm. This offset effect will be reduced by a factor of 10 (to 0.02 ppm for a 1 mV offset) when the PIDs are reranged to a 0-20 ppm scale, as described later in this report.

Another potential source of error discussed with the Orr service representative is that the Microtip's output to the recorder can be a few millivolts, even when the Microtip sees no gas and is indicating zero ppm on its built-in local display. According to the manufacturer (Photovac) this is due to design limits in the resolution of the Microtip output. Again, this effect will be reduced by a factor of 10 when the PIDs are reranged to a 0-20 ppm scale, as described later in this report.

<u>MEETING WITH PAUL FILOSA OF ENSR</u>

On December 7, 1993 Paul Filosa, ENSR's Principal/Manager of the Air Monitoring Division, made a second visit to the site to discuss his previous findings and any new recommendations with Gary Duke of RRS. Some of the relevant topics discussed are described below.

1. Ways to reduce effects of humidity on PIDs - Discussed possibility of installing a filter such as that manufactured by Perma Pure Products, Inc. and a booster pump to overcome the pressure drop caused by use of such a filter. Paul felt that use of this type of filter will not interfere with the sensitivity of the PIDs to the ReSolve site target compounds, provided that calibrations are also done with the calibration gas running through the filter. Gary will discuss this idea further with Will Brocker.

2. Ways to reduce effects of humidity on dust monitors - Discussed what, if any, effect humidity has on these units, as conflicting information had been received from other sources. Paul said that humidity <u>will</u> have some effect on aerosol monitors such as these. Unlike the PIDs, filtering is not an option, as any filter that would remove moisture would also remove the dust which is the target parameter being measured. Experience on other sites is that this is a problem that we will have to live with, although its effect is usually relatively minor.

3. Effects of sample air temperature on PIDs - Paul noted that PIDs designed for continuous use typically have an ionization chamber which is heated to 100^0 C. to avoid this problem, the field-type units presently used at ReSolve do not have this

feature. However, he did not feel that it is likely to have a major effect and is probably not a significant contributor to past problems.

4. Effects of sample air temperature on dust monitors - Paul noted that sample temperature can have a noticeable effect on aerosol dust monitors. There is an inverse relationship between temperature and the resulting readings, so false high readings tend to occur when the temperature is dropping. Gary suggested using a longer sample tube with most of the tube inside the temperature controlled enclosure to alleviate this. Paul said that using tubing long enough to have much effect would probably also act to some extent as a filter for the dust we are attempting to measure, thereby rendering the results invalid. His experience on other sites is that this is a problem that we will have to live with. Our twice per day calibrations may be enough to eliminate this as a significant source of error.

5. Effects of ambient air temperature on electronic components of both PIDs and dust monitors - Paul said that this can have a very noticeable effect on both instruments. Although our perimeter stations have heaters and ventilation fans the enclosure is so large that potentially significant temperature variations can occur, especially when personnel open the door to enter for calibrations or checks. At another site Paul uses Hoffman electrical enclosures with heaters and air conditioners to house the instrument electronics, since the temperature of these smaller enclosures is more readily controlled. Gary will look into doing something similar at ReSolve if needed. At present it appears that the more frequent calibration schedule presently in use is catching any temperature related effects before they grow large enough to be of concern.

6. Reranging PIDs to 0-20 ppm scale - We discussed the idea of reranging the PIDs to work on the 0-20 ppm scale, rather than the 0-200 ppm scale which had been in use. Paul agreed that this would have several benefits and should be implemented as soon as possible. This was done on December 10, see report on Photovac site visit later in this document. Among the benefits are increasing the accuracy of the readings in the areas of concern by calibrating with 10 ppm span gas and reducing the effect of millivolt fluctuations in the Microtip output and/or Telog input circuitry.

7. Elimination of "offsets" in readings - As previously discussed, changes in the Telog boards and reranging the Microtips should help to eliminate or at least minimize the impact of this problem. However, Paul noted that if these measures are less than 100% effective it is an acceptable practice to note the existence of any "offset" due to

electronic characteristics of the instruments at the time of calibration and subtract that offset from subsequent readings. Many data acquisition systems in common use in similar applications since the time that the ReSolve system was purchased perform this correction automatically. In our case it would have to be done manually, using the computer printout of the readings and noting the offset value immediately after calibration.

8. Ways to reduce effect of equipment and radio "noise" - Rust personnel have noticed that operating some types of heavy equipment near the perimeter stations appears to affect the instruments on occasion, possibly due to interference from the equipment's ignition systems. In addition, operation of walkie-talkie portable radios often has an effect, especially on the readings transmitted to the computer. Paul acknowledged that this type of electronic interference is a common problem but knows of no practical way to shield the instruments themselves from it. Since our long data transmission lines from the Telog data recorders in the stations to the computer in the H&S trailer are digital rather than analog they are not affected. That has been a problem on other sites that used analog data lines, especially if they used voltage rather than current signals.

9. Alternative systems - We had an extensive discussion about possible alternative systems and vendors for both the instruments themselves and the data acquisition system. We agreed that while the present system is certainly less than the present state of the art it is adequate for its intended purpose at the ReSolve site, given the action levels which we must meet. An obvious disadvantage is the amount of labor required for calibration and maintenance, this makes it unlikely that the existing system would be used again for a long-term application such as this one. We agreed that the long lead time for purchasing a complete new system, installing it and training our personnel in its operation and maintenance make this option prohibitive for the ReSolve site, given the relatively short remaining duration of treatment activities.

SERVICE CALL BY PHOTOVAC

On December 10, a representative of Photovac (the manufacturer of the Microtip PIDs) visited the site to service and rerange the units and to provide additional training to Rust's Health and Safety Technicians in the field repair of common problems, including lamp and detector cell replacement.

Under his direction, all of the perimeter monitoring station PIDs were reranged to a 0-20 ppm scale, in contrast to the 0-200 ppm range previously used. The units were then calibrated using 10 ppm isobutylene span gas, instead of the 100 ppm gas previously used. The computer was reprogrammed to recognize the signals now received from the PIDs (via the Telog data loggers) as corresponding to the new range of 0-20 ppm.

As previously discussed, this reranging should reduce by a factor of 10 the effect on the computer output reports (which are reported in ppm) of millivolt offsets and drift in both the Microtip output and Telog input. The reranging will not, however, have any impact on drift caused by fouling of the Microtip lamp of detector cell by moisture or other environmental factors.

ADDITIONAL CHANGES

During the week of December 13-17, Rust site Health and Safety Technicians revised the sampling lines to eliminate copper tubing and replace it with flexible plastic tubing. The plastic tubing should be less subject to condensation on its internal surfaces as a result of temperature changes. It is also not subject to corrosion; it is suspected that the copper tubing may have had some internal corrosion that might have tended to trap moisture. The new sampling lines were also oriented to reduce the possibility of wind-driven rain entering the sample ports.

I would like to take this opportunity to thank ENSR for suggesting the use of Mr. Filosa as a consultant on this problem. His obvious depth of knowledge and experience in this field enabled him to make several useful new suggestions, as well as confirming some of our own theories as to potential causes and cures.

Please contact me if you have any questions regarding this matter.

Very truly yours,
RUST Remedial Services Inc.

Gary W. Duke, P.E.
Senior Project Manager

cc: Will Brocker- Birmingham, AL
Wayne Thurman
John Emery
Erich Bleiweiss
Steve Shea
Peter Larson
Kate Schweitzer
site file

Dukefile: c:\wp51\resolve\ensr.ltr\perimair.174

PHOTOVAC

To: Pete Larson
From: Pascal LaFantano
Date: January 7, 1994
Re: MicroTip Training

To whom it may concern,

On December 10,1993 , I visited the CWM/Resolve site in North Dartmouth Massachusetts at the request of Pete Larson. The purpose of this visit was two fold. One to inspect the manner in which the Microtips are set up in the perimiter stations. Secondly, to provide maintenance training and answer questions concerning Microtip use and operation. This was performed with the Health and Safety group.

During the training, I also covered the cleaning and rebuilding of the internal sample pump and two electrode detector. From this point forward, the Health and Safety group will be able to perform these rebuilds on site. Coupled with the maintenance covered in the manual, that was reinforced during the session should minimize instrument down time. And ensure reliable data collection.

From my observations, the Health and Safety group is performing proper Microtip calibration and maintenance. The manner in which the Microtips are being used is consistent with the manufactures operational parameters, and will not present any problems with the units performance/reliability.

Best regards,
Pascal LaFantano
Senior Service Technician

CORRECTIVE ACTION PLAN

Perimeter Monitoring Action Levels and Response Program

1. **Revise Rust On-Site Reporting Requirements**

   The daily Perimeter Monitoring Station Summary Report will be submitted to Rust Remedial Services' on-site Quality Assurance Manager for a review of all data. The RRS Quality Assurance Manager and/or the RRS Project Manager will notify the Project Coordinator of any exceedances.

2. **Internal Audit**

   Rust Remedial Services will immediately assign the Division Safety Manager or designee to perform an audit of the ReSolve Site for the purpose of auditing each aspect of the Air Monitoring Plan for complete compliance with all plan requirements.

   The assigned Safety Manager or designee will provide the on-site Health and Safety staff with any additional training that may be identified as a result of this audit.

   Documented audit results will be a discussion topic for the December Source Control Monthly Progress Meeting.

3. **Perimeter Monitoring Action Levels and Response**

   Real-time readings will be taken when 50 % of the station instantaneous alarm limit has been reached (thus the alarms will be set at 2.5 ppm VOC and 2.5 mg/m^3 for dust). This action will require that real-time readings be taken on a more frequent basis. This policy will result in an early response to potential exceedances due to actual field conditions and the reduction of false exceedances due to instrument errors.

4. **Calibration Frequency and Monitoring Equipment Upgrades**

   Routine station calibrations will now be performed twice daily and station inspections will be performed four times daily to ensure that instrument error is minimized. More frequent calibration or inspection will be performed if problems are detected.

   The monitoring equipment used will be inspected by the station original equipment manufacturer (Orr Safety) and possible upgrades, if any, suggested by them will be evaluated. Again, the intent is to ensure that instrument error is minimized.

   Enough additional equipment will be purchased to ensure spares are always available. This will allow for frequent routine servicing by the equipment manufacturer. It is anticipated that each station will be serviced at two-month intervals. Sufficient spare parts will be made available to completely rebuild a station.

5. **Work Operations Reporting**

Each employee at ReSolve will be instructed to record all work activities in the immediate vicinity of the Monitoring Stations with the Health and Safety Officer. The purpose of this action is to document possible causes of false exceedances.

Examples of such activities that would result in false readings would be chain saw or grass cutting equipment used in the vicinity of the Monitoring Stations.

6. **Employee Training**

A training session will be held with all site personnel to ensure that each employee has a working knowledge of all site reporting requirements.

The purpose of this training session will be to ensure that any further misunderstandings regarding site specific reporting requirements are eliminated.

7. **Monthly Perimeter Air Monitoring Results Review**

Perimeter air monitoring results will be a recommended agenda topic for each source Control Remedy Monthly Progress Meeting. This recommendation is being made to ensure that perimeter air monitoring maintains high visibility for the duration of the Source Control Remedy.

8. **Revised Reporting Format**

The Perimeter Monitoring Station Summary Report has been revised to include a new section for reporting of daily average exceedances. The reporting requirements are stated and a telephone communication log must be attached to the form to document the reporting.

The Perimeter Monitoring Station Summary Report and the Event/Personnel/Perimeter Filter Media Sampling Summary Report will be submitted to the Project Coordinator with the monthly Progress Report. A summary table of the results of the filter media sampling will be included with the summary reports. These reports have been submitted to the Project Coordinator as part of the routine Health and Safety Weekly Reports.

APPENDIX C

X*TRAX EMERGENCY SHUTDOWN PROCEDURES, DATED JULY 20, 1993

X*TRAX SYSTEM OPERATING PROCEDURES FOR HANDLING OF SOIL LEFT IN THE DRYER DURING EMERGENCY SHUTDOWNS AT THE RESOLVE SITE

Revision 0, July 20, 1993, Gary Duke

PURPOSE: The purpose of this procedure is to ensure that soil left in the dryer after an emergency shutdown of the X*TRAX system is adequately treated prior to discharge or, failing that, to ensure that untreated or inadequately treated soil is isolated from other treated soils in the discharge bins. The soil in question must then be retreated unless it is sampled and analyzed separately to ensure that it meets the ReSolve Site target treatment criterion of <25 ppm PCB.

PROCEDURE: In the event that it becomes necessary to shut down and cool the dryer while soil is still in it, one of the following measures must be taken:

1. Correct the problem, then restart, using the normal warmup cycle prior to resuming feed. In this case, it is not necessary to isolate the discharged soil. This will be the procedure used in almost all cases and requires no special documentation beyond the normal log entries for stop/start feed.

2. If the dryer must be emptied to correct the problem then one of the following measures must be taken. The decision as to which procedure to use will be at the discretion of the operator and will depend on evaluation of the operational and economic factors involved in going through a reheat cycle per procedure 2a in order to salvage the soil in the dryer as opposed to emptying the dryer immediately using procedure 2b, with the possibility that the soil will then require retreatment.

   If any of the procedures below are used the event <u>must be documented in the log and the Project Manager must be notified</u> of the unusual occurrence so that he can respond to any questions raised by the regulatory agencies, the client or company management.

2a. Reheat the dryer through the normal warmup cycle, maintaining only minimal rotation required to prevent warping of the kiln. After reaching the temperature at which feed would normally be started, secure main flame and cool down normally. This warmup/cooldown cycle will treat soil in the dryer sufficiently to meet the ReSolve Site target treatment criterion of <25 ppm PCB. After cooldown is complete, the dryer can be rotated to empty it. In this case, it is not necessary to isolate the discharged soil.

2b. Without attempting to restart or reheat per procedures 1 or

2a, rotate the dryer to run the soil out cold. In this case, it is necessary to isolate this soil to prevent possible contamination of treated soil in the discharge bins. This can be accomplished in one of three ways, listed below in order of preference.

2b1 Isolation can normally be accomplished by discharging the cold soil into an empty bin. This should be noted in the log and that bin marked as not to be used for treated soil, pending analysis of the cold soil. The Project Manager and QC staff should be notified immediately so that the cold soil can be sampled and analyzed.

2b2 If no empty bins are available, it may be possible to empty the cold soil directly into a dump truck. The soil may be held in the truck or dumped into an empty intermediate bin if one is available. Again, the Project Manager and QC staff should be notified immediately so that the cold soil can be sampled and analyzed.

2b3 If no discharge bins or intermediate bins are available and if site operations cannot permit a truck to be tied up during the time required for off-site analysis, a last resort is to run the soil into a truck and truck it to the screened dirty soil pile. This requires that the soil be recycled through X*TRAX and should be avoided if possible, unless reason exists to believe that the soil contains PCBs above 25 ppm, in which case it will require retreatment in any event. The ENSYS test can be performed on-site quickly and can provide useful information in making this decision. Any ENSYS results should be discussed with the site QC Manager before using them in decision making.

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APPENDIX D

LETTERS REGARDING SOURCE CONTROL CLOSEOUT ISSUES INSPECTIONS: EPA LETTER DATED DECEMBER 19, 1994, AND RUST LETTER DATED JULY 12, 1995.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

8834.123-1

RECEIVED
DEC 28 1994
P.A. CALL

→ HKR

December 19, 1994

Mr. Michael Last, Esq.
Mintz, Levin, Cohn,
Ferris, Glovsky & Popeo
One Financial Center
Boston, MA 02111

RE: Re-Solve, Inc., Superfund Site: December 14, 1994, EPA/MADEP Source Control Closeout Site Walk Over

Dear Mr. Last:

The U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MADEP) conducted a site walk over of the Re-Solve Superfund Site, North Dartmouth, MA, to inspect the completion of the source control remediation. Specifically, this included the inspection of the site grading and crushed stone cover, Waste Management Area (WMA) fence, WMA side slopes into surrounding wetlands or adjacent properties, and long-term site security. As a result of the site walk over, we have established a list of items which should be addressed for Site Closeout. These items are as follows (see attached map for locations):

1) The north access road, north access road/WMA entrance, and south access road/WMA entrance will have sliding chain link security gates, while the south access road will have a post and chain link gate. It was observed that the north access road/WMA entrance and south access road/WMA entrance will be secured with a chain and lock. Please confirm or explain how these access gates will be secured. Also, EPA should receive a copy of the keys used to access the Site.

2) RUST Remedial Services, Inc., has recently placed grass seed down in bare areas not covered with crushed stone at the site (e.g. north and south of the north access and south access roads, wetland side slopes, Reed property south of the Site, area south and east of the DNAPL Well point, etc.). Unfortunately, germination has not occurred because of the late planting. If adequate grass growth is not obtained next spring, then RUST will be required to re-seed these areas, as necessary.

3) According to the approved Implementation Plan, "all remaining debris, both hazardous and non-hazardous, will be removed and disposed of by CWM after final SCR closeout." There were a number of areas on-site which have non-hazardous debris remaining. Specifically, the non-hazardous debris are located at the following areas:

A) Along the west side slope entering into the North Wetlands, there is tree debris from site grading/fencing operations which should be removed. There are also bottles remaining on top of the surface of the side slope. These bottles were apparently a result of the previous site owner's operations. However, the bottles prohibit the germination of grass seed, could migrate into the restored wetlands, act as an eyesore compared to the remediated areas on-site, and will only invoke questions from the public regarding the quality of the remediation during the past two years. In addition, areas of crushed (1/2"-1") stone from the support zone road base remain just beyond the fence line, and prohibit grass growth. It is requested that the tree debris created by RUST be removed, bottles lying on the surface of the side slope be removed, the crushed stone be removed, and the side slopes seeded.

B) Along the north side of the north wetlands fence there are still areas with crushed stone remaining. These areas have been seeded. The crushed stone should be removed because it prohibits germination of grass seed and where located in the wetlands, is not part of the restoration plan. The crushed stone should be removed.

C) Along the north side slope of the East Wetlands there is tree debris remaining in this area. Tree debris created by RUST should be removed and side slopes seeded.

D) Hay bales remaining on-site, other than those being used for erosion control along un-vegetated side slopes (i.e. along Carols Brook), should be removed. Specifically, these hay bales are located near the former perimeter air monitoring station number #4, south of the unnamed tributary culvert flowing towards the East Wetlands, and along the southern portion of the East Wetlands.

4) The east side of the North Wetlands is ponded with water. This ponding appears to be greater than pre-remediation ponding (westward and southward). It is requested that RUST's wetlands subcontractor, Coastal Environmental, and EPA's USF&W counterpart, Tim Prior and HNUS wetland specialist, Kevin O'Neill, meet on-site to evaluate the potential impact to the species planted during the wetlands restoration. In addition, the fence installation in this area is not what was approved during the September 28, 1994, Monthly Source Control Progress Meeting, and October 4, 1994, EPA correspondence to ENSR. The fence fabric stretches around the metal sono tubes, creating a gap along the sono tube, allowing crushed stone to migrate beyond the fence boundary possibly into the wetlands. Crushed stone should not migrate beyond the WMA fence boundary. Any crushed stone migrating beyond the fence boundary should be removed either now or when the surface water recedes during warmer weather. RUST

should also evaluate the stability of this side slope to the fence line and into the north wetlands. During dryer months, there may be a need to further stabilize this slope beyond the fence line into the wetlands with clean off-site soil and seed/erosion control matting.

5) At the east corner of the WMA, where three fences meet at a point (two WMA fences, and the site perimeter fence), additional clean off-site soil needs to be placed underneath the fences. Because of the elevation change, there is a two foot gap under the fences. A small amount of clean off-site soil has been placed in the area under the fence, but additional soil is needed to secure the area.

6) There are approximately 12" gaps under the WMA fence line just east of the DNAPL well point cage and along the east side of the DNAPL well point cage. These gaps should be adequately filled in to prevent future access, as well as any other significant gaps along the WMA boundary.

7) During our inspection, the Copicut River Tributary located along the east side of the East Wetlands was flowing northward into the Copicut River. This flow is opposite the tributary's pre-remediation flow direction. EPA requests an explanation for this reversal and flow (e.g. permanent/temporary, why), possible impacts to the north wetlands restoration, and as necessary, any modifications to the tributary.

If you should have any questions regarding this correspondence, please contact me at (617) 573-9622.

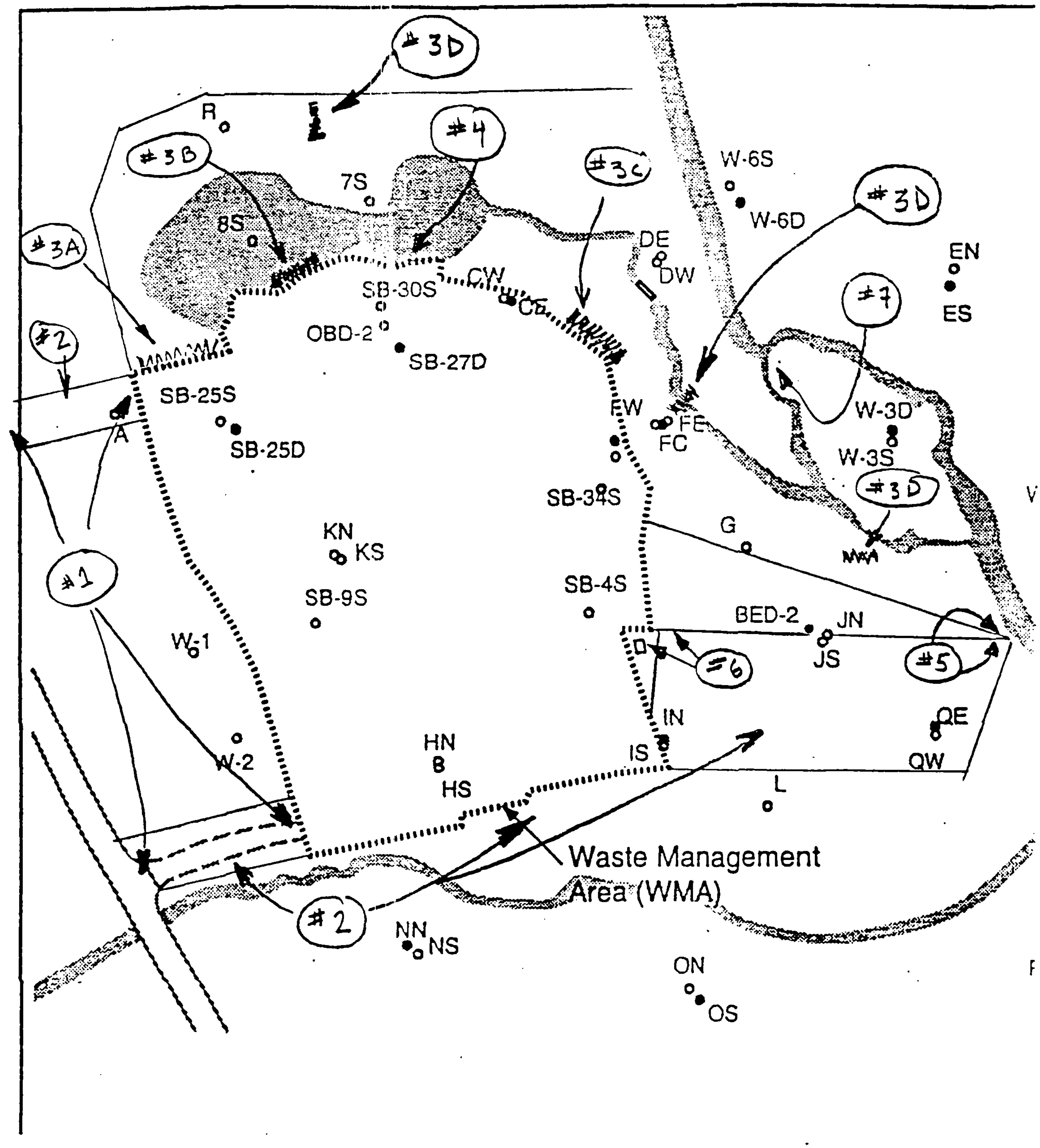
Sincerely,

Joseph F. LeMay

Joseph F. LeMay
Remedial Project Manager

cc: Paula Fitzsimmons, EPA
Timothy Prior, USF&W
Kevin O'Neil, HNUS
Phoebe Call, BEI
Nikki Korkatti, MA DEP
Michael Worthy, ENSR

12|14|94 SITE WALK OVER MAP



RUST REMEDIAL SERVICES INC.

3220 Tillman Drive, Suite 200
Bensalem, PA 19020-2028
Tel. (215) 245-8100
Fax (215) 245-8116

July 12, 1995 Document No. 492935-950031

Michael Worthy
ENSR Consulting & Engineering
35 Nagog Park
Acton, MA 01720

Subject: Re-Solve, Inc. Site, North Dartmouth, Project #492935
June 21, 1995 Site Inspection - Closeout Issues

Ref: EPA/MADEP SCR Closeout Site Walk Over Letter Dated December 19, 1994 and RRS Documents No. 492935-950006, 492935-950029 and 492935-950030 in Response to EPA/MADEP Comments.

Dear Mr. Worthy:

During the June 21, 1995 site inspection, the above-referenced EPA/MADEP comments and RRS responses regarding the SCR site closeout were discussed. The following is a revised list of RRS responses which indicates the present status of those issues which needed to be addressed. The actions to be taken and status of these issues were agreed to by the EPA, MADEP, PRP and Rust representatives during the June 21, 1995 site meeting. Attached is a copy of the sign-in log for the June 21 meeting.

Closeout issues:

1) Gates - No further action was required.

2) Seeding - During the June 21, 1995 inspection the seeded areas were found to be acceptable. These areas will continue to be inspected as part of the Long term Operation and Maintenance Inspections.

3) Non-Hazardous Debris

A) North-West GAP Area Debris

Woody Debris - No further action was required.

Glass Bottles - The bottles on the surface were removed on June 19, 1995 and disposed as non-hazardous construction debris. The clean-up was approved by the EPA during the June 21 site meeting.

Seeding Adjacent to Fence - As indicated in item 2 above, the seeded areas were found to be acceptable during the June 21 inspection. These areas will continue to be inspected as part of the Long term Operation and Maintenance Inspections.

B) North-West Wetland Crushed Stone - No further action was required.

C) East Wetland Tree Debris - No further action was required.

D) Hay Bales - Hay bales from the southern portion of the East Wetland and the intermittent stream north of the North Wetland were removed from the wetlands or spread in the surrounding areas on June 19. The hay bales south of the unnamed tributary culvert were not disturbed due to vegetation growth from the decomposing hay bales.

During the site inspection on June 21 it was agreed that additional hay bales would be removed from the intermittent stream and south of the culvert. It was also agreed that the decomposing hay bales would be spread throughout the surrounding area to promote an accelerated rate of decomposition. This was performed on June 21 after the site inspection.

Any further action in reference to the flow restrictions due to hay bales in these areas will be addressed as part of the Fall 1995 Wetland Monitoring Inspection.

4) North-East Wetland

Impact of Ponded Water - During the June 19 inspection, the water level of the wetland had not decreased to the desired level to performed an assessment. It was agreed that the ponded water area will be evaluated as part of the Fall 1995 Wetland Monitoring Inspection.

Impact of Crushed Stone - During the June 21 inspection the crushed stone north of the fence in the ponded area was raked, thereby mixing it with the adjacent and underlying sediments. Native soil from the GAP Area was mixed with the crushed stone along the edge of the pond and the area was planted with wetland grasses. Any further actions in reference to this item will be addressed as part of the Fall 1995 Wetland Monitoring Inspection.

Fence Repairs - All required fence repairs were conducted on June 19 and approved by the EPA representative during the June 21 site inspection. Any further actions in reference to the fence condition will be addressed as part of the Long Term Operation and Maintenance Inspections.

5&6) Site Fence - Even though no further action was required, minor repairs were made at the intersection of the west fence and the NAR south fence.

7) Unnamed Tributary - No action was required.

8) General Construction Debris - The debris was picked-up on June 19 and the clean-up approved by the EPA during the June 21 inspection.

9) Exposed Crushed Stone - The exposed crushed stone in the GAP Area, between the ponded area of the North Wetland and the WMA, north of the WMA fence, was covered with soil from the GAP Area and erosion control fabric on June 19 and 21 and later seeded. Any further action in reference to this item will be addressed as part of the Long Term Operation and Maintenance Inspections.

10) Log Removal - The log located near the wetlands, in the area mentioned in item 9, and the logs which were located north of the unnamed tributary culvert located north of the East Wetlands, were relocated away from any stream flow and foot traffic.

During the June 21 inspection it was agreed that all close-out issues relating to the demobilization of the site have been addressed and require no further action. Any issues which were not resolved will be addressed as part of the Wetland Monitoring Inspections or the Long Term Operation and Maintenance Inspections.

If you have any questions or comments, please contact E. E. Cintra at (609) 588-6353.

Sincerely,
RUST Remedial Services Inc.

Edmundo E. Cintra

Edmundo E. Cintra
Project Engineer

eec

cc: G. Duke
M. Gallagher

C:\JUL\950031

6/21/95 WEDNESDAY

The following log performed by EDMUNDO E. CINTRA PROJECT ENGINEER - OHM CORP.

The purpose of todays site visit is:
① 1st LONG TERM OPERATION & MAINTENANCE INSP.
② 2nd WETLANDS RESTORATION INSPECTION
③ INSPECTION OF CLOSE-OUT ACTION ITEMS
(as discussed on log of 6/19/95)

ATTENDANCE LOG

NAME	COMPANY	PHONE #	IN	OUT
EDMUNDO E. CINTRA	OHM	(609) 588-6373	0800	1330
Dennis Z Pacheco	Danson	(508) 994-6989	0800	1200
Mark Gallagher	Coastal	609-477 0966	0815	1330
Michael Worthy	ENSR	508-635-9500	9	1045
Palmer T. Hedly	Danson	(508) 994 6989	0800	1200
Susan Drennan	Minty Levin		920	1045
Henry R Lasman	Compo Chem.	(508) 540-2067	9:20	1045
Michael [illegible]	Mintz Levin	(617) 348-1637	"	1045
R.C. Hatfield	Haddy	508 263 2741	"	1045
Carl Tammi	ENSR	(508) 635-9500	9:10	1330
Steve Schroeder	Goodwin, Procter & Hoar	(617) 570-1371	9:30	1045
Phoebe Call	Raytheon Engis	(617) 494-7833	10:15	1330
David Buckley	MA DEP	617 556-1184	10:15	1330
Joseph A. LeMay	EPA	617 573 9622	10:15	1330
Kevin O'Neill	HNUS	508 658 7899	1000	1330
P FARIA #39	DARTMOUTH POLICE	508 999-0737	5:45	6pm

APPENDIX E

LESSONS LEARNED FROM THE LOW THERMAL DESORPTION SOURCE CONTROL REMEDY AT THE RE-SOLVE, INC. SUPERFUND SITE, NORTH DARTMOUTH, MA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

DRAFT DOCUMENT - DO NOT QUOTE OR CITE

Date: May 23 - 25, 1995

Conference: National Academy of Remedial Project Managers (NARPM), San Francisco, CA

Presentation: Lessons Learned with PRP Lead Low Thermal Desorption Remedial Action

Site: ReSolve, Inc., Superfund Site, N. Dartmouth, MA

Contaminates of Concern: PCBs, 1,1 DCE, PCE, TCE and Lead in soils. Note: The clean-up level for soils was established at < 25 ppm PCBs. No other COCs were used for establishing clean-up levels because PCBs were prevalent in the soils throughout the Site.

R.A. Technology: Low Thermal Desorption (X*TRAX)
Contractor: OHM Remedial Services, Inc.
(Formerly: RUST Remedial Services, Inc.)

R.A. Status: Excavation and treatment of approximately 36,000 cubic yards of PCB contaminated soils through Low Thermal Desorption began on June 21, 1993, and was completed on July 19, 1994 (total of 13 months). Decontamination and Demobilization was completed in December 1994.

RPM: Joseph F. LeMay JFL
EPA Region 1
MA Superfund Section
(617) 573-9622

LESSONS LEARNED FROM THE LOW THERMAL DESORPTION SOURCE CONTROL REMEDY AT THE RESOLVE, INC., SUPERFUND SITE, NORTH DARTMOUTH, MA

TREATMENT PROCESS

1) The original design called for treated soils to be transported to the product cooler via vibratory V-trough conveyors. However, the transition boot between the conveyors developed tears and created a dust control problem. Attempts were made to repair/replace the boots, but this was unsuccessful. The vibratory V-trough conveyors also had a problem with transporting extremely fine material, which would build up and harden on the conveyor, impeding material flow. After two months of experimenting with various boot materials, the problems were corrected by removing the vibratory conveyor, repositioning the product cooler immediately after the rotary dryer, and transporting the wetted soils from the product cooler to a radial stacker by a standard conveyor belt system.

2) The treated soil exiting the rotary dryer was very hot and dry with a temperature around 600° F. The product cooler would receive the treated soil and spray treated water on the soil to cool it down, restore its original moisture content, and increase its manageability. Steam generated from the cooling process would exit the product cooler stack. The original design equipped the product cooler with a spray tower, demister and a blower to remove dust from the steam. However, the process was inefficient at removing the dust particles from the steam, and had to be altered. A series of sprays, chevron packings, mesh pads and a powered cyclone (called a Powerclone) were added to the vent stack to remove excessive dust. The mesh pads, chevron packings, and water sprays acted as a wet scrubber removing the larger dust particles from the steam. The fine dust particles were removed by the powerclone, which has a high pressure water spray that centrifugally forces the fine dust particles out of the steam and washes them to a discharge hose. This modification eliminated a majority of the dust emission problems by November 1993.

Another area requiring additional attention is the product cooler, soil/water mixing paddle. Insufficient mixing of water with soil due to product cooler paddle wear, as well as insufficient volume of water fed into the powerclone, resulted in occasional short-term dust releases. It is important to monitor these areas, paddle wear and volume of water added versus soil throughput, to minimize any dust release. Towards the last 4 to 5 months of operation, the treatment process became more efficient, and treated higher contaminated soil input volumes (260 - 360 tons/day, occasionally higher). To accommodate the higher volumes of soils and further decrease the possibility of dust releases, a high pressure pump was installed at the Powerclone in April 1994, to allow for more water to be sprayed when processing higher soil throughputs.

3) It is recommended that all potential emissions sources from a thermal desorption process be monitored comprehensively during full scale pilot, shake down mode, and periodically during operations for organic and inorganic compounds. The periodic monitoring of these vents will measure the release of specific compounds, provide actual data under each phase (pilot, start-up, full operations, and ensure the protection of human health and the environment. This monitoring includes process vents and steam vents.

4) The phase separator was not effective at separating the organic contaminates and water from the organic condensate waste water stream. The original design called for the separated water to be treated through GAC beds and added to the product cooler to cool the treated soil. However, the carry-over of organic contaminates and particles in the waste water resulted in frequent changes in GAC beds, and on one occasion re-contaminated treated soil above the 25 ppm clean-up level. As a result of this problem, a Klensorb (combination GAC and clay filter) filtration system was installed in November 1993, and the separated water was no longer used for cooling treated soil in the product cooler. Instead, the separated water was diverted to the on-site Water Treatment System (WTS) for further processing. A portion of the WTS effluent was then pumped to the product cooler, and mixed with the treated soils. Shortly after installation, it was observed that Klensorb was difficult to change out during maintenance. Therefore, the Klensorb filter was replaced with an ultrafiltration membrane system. The membrane system was easier to change and more efficient at removing organic contaminates, but the membranes rapidly clogged, could not be re-generated as the manufacturer suggested, and had to replaced frequently. Because of the costs associated with the membrane system, it was removed from the treatment process in May 1994, and the Klensorb filtration system re-instated. Note: At this stage of the treatment process, a Biological Treatment process followed the Klensorb system (see below). The contractor considered it to be more cost effective to have higher maintenance with the Klensorb, then to purchasing new membranes every time they clogged.

5) Diverting the condensate waste stream to the on-site WTS created another problem. The higher organics in the separated water stream increased the WTS effluent's acetone concentrations above the acetone discharge limit allowed under the permit equivalency. Because acetone is a light weight molecular compound and highly soluble in water, it is not efficiently removed by condensation, GAC, and/or air stripping. Therefore, much of the acetone remained in the WTS effluent. In order to effectively remove the acetone and resolve this problem, a biological treatment process was added in February 1994, after the ultrafiltration/Klensorb filtering process. Specifically, an aerobic biological fixed film aqueous treatment system was installed. Emissions from the biological treatment process were treated using a separate 1000 pound GAC canister and then discharged through the X*TRAX process vent. It took a while for the microbes in the biological treatment system to acclimate to the waste water stream, and the microbes were very sensitive to pH fluctuations. If a biological treatment system is considered for aqueous streams, it is highly recommended that automatic/self adjusting pH devices be installed and that the schedule allow for an extended start-up period.

6) Perimeter air monitoring is very important for assuring the community of their safety. The designed perimeter monitoring plan called for daily calibration of real time perimeter monitoring instruments (Microtip PID for total VOCs, and aerosol dust monitor); and filter media sampling (VOCs, and PCBs) once a week from the downwind monitoring station. Action levels for respirable dust and total VOCs were established at 5.0 mg/m^3 and 5.0 ppm, respectively. However, the real time monitoring instruments are very sensitive to temperature/climate changes, resulting in false positive readings at the perimeter monitoring stations. As a result, the perimeter air monitoring system was modified. The calibration of the continuous monitoring instruments was increased to twice a day, and the instruments checked an additional four times per day to ensure instrument drift was not occurring. Filter media samples were collected once per week from all monitoring stations to ensure analytical data from all directions, because the site's topography allowed for significant variations in wind direction. In addition, the alarms for the action levels were lowered by 50% to 2.5 mg/m^3 for respirable dust and 2.5 ppm for total VOCs. At the time of design, this perimeter monitoring system was considered state of the art. However, improved perimeter monitoring systems exist, which will provide compound-specific data. One system involves the mobilization of on-site labs and the use of GC/MS. Lab technicians provide analytical data every 15 minutes. If possible, this type of perimeter monitoring system should be considered at a site involving the excavation and treatment of

VOCs contaminated soils. The compund specific data provided by this type of monitoring system is invaliable when assessing any emission concerns during RA along the perimeter, as well as possible off-site impacts.

7) The structure housing the low thermal desorption treatment facility, should be oversized by 25%. Therefore, if modifications or amendments to the treatment facility become necessary, there will be sufficient space to accommodate them.

CONSTRUCTION PROCESS

8) It is recommended that sample screening tests be used to estimate in-situ contaminate concentration in soils, so that the construction/excavation process can be accelerated. At the ReSolve Site, the contractor was permitted to use Ensys Immunoassay Test Kits to estimate the PCB concentrations in soils. The immunoassay testing provided an estimated PCB concentration within a 30-minute period, which allowed the contractor to determine whether to continue excavating or move their heavy equipment to another area. Initially, data collected by the Ensys immunoassay testing was confirmed with laboratory analyses. The results indicated that the immunoassay data correlated 90% with the laboratory data. The other 10% were identified as false positive (Ensys results should a higher PCB concentration than the laboratory data). The use of Ensys immunoassay testing accelerated the excavation process, and increased the operating efficiency of the excavation equipment. The use of Ensys was initially proposed for post excavation and treated soil samples, but was expanded to testing soil in intermediate bins and decontamination of equipment and concrete pad cores. Note: Ensys immunoassay testing was not used for confirmation sampling. All post excavation confirmation soil sampling was analyzed for PCBs through a laboratory.

9) In the original design, the dust control measures for excavated contaminated soil and treated soil piles were watering and covering with a geotextile. Covering the large soil piles with geotextiles was ineffective for two reasons: 1) wind consistently disturbed or blew the geotextile fabric off the piles; and 2) maintaining the geotextile fabric was a drain on resources. As a result of these problems, the contractor replaced the geotextile with an inert cellulose spray covering system, called Posi-shell. At the end of every day, the soil piles were sprayed with the Posi-shell, which hardened preventing dust migration, and reducing precipitation infiltration. Posi-shell was also used in excavation areas along property lines and high VOC soils to minimize VOC emissions. During the day, the contractor would dig into the contaminated soil pile and run the

contaminated soil and Posi-shell through the treatment process. The Posi-shell system was very effective at preventing dust migration, and required little maintenance.

10) Two wetlands, approximately ½ acres each, were excavated and restored on-site. Restoration of the wetlands required the placement of root wads (tree stumps with roots). The root wads will naturally degrade into hummocks. It is recommended that root wads be used in wetlands restoration, where applicable.

11) Surface water runoff controls are very important, and should be monitored and maintained continuously throughout the remediation. As the location of excavation changes, so should the surface water run off controls. At the site in March 1994, a rain event caused flooding around the contaminated soil pile, which migrated into previously remediated areas. EPA required all contaminated sediments to be removed from clean areas, and the underlying soils to be sampled for PCBs, to ensure that the remediated areas were still below the PCB clean-up action level. As a result of this sampling, some areas had to be re-excavated. Surface water runoff controls are very easy to implement, but are most often overlooked during remediation. It is recommended that surface water runoff controls be monitored continuously and the contractor assign someone the responsibility for maintaining those controls.

12) During pre-design, a kreiging model was used to delineate the extent of contamination. The model predicted that some layers of soils would be below the PCB clean-up level. Based on this model, the contractor excavated these layers of soils and placed them in an intermediate storage bin for sampling. If the soil in the bin was below the 25 ppm clean-up level, then it was used as backfill. If the soil was above the 25 ppm clean-up level, then it was treated through the treatment process. However, a majority of the intermediate bins were above the action level (> 75% of bins were contaminated above 25 ppm) requiring treatment. In hindsight, the contractor would have preferred to excavate these supposedly clean-layers and treat them through the low thermal desorption unit. This would have eliminated the use of intermediate bins, and saved the contractor time and money by eliminating the need to collect samples for analysis, and construct and move the bins.

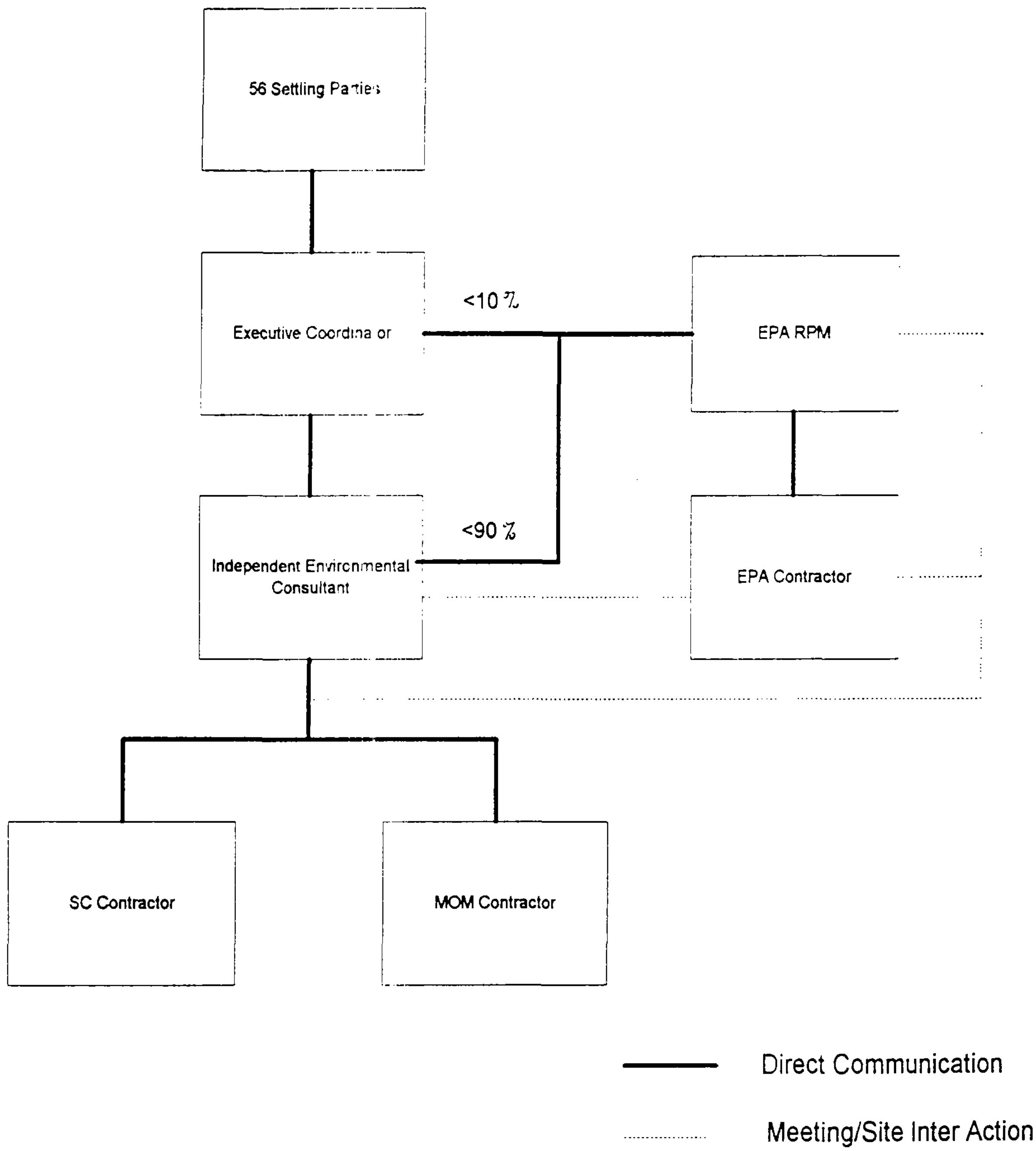
13) The low thermal desorption process treated between 100 - 360 tons of contaminated soils per day. During the winter, the treatment process had its lowest production rates, ranging between 100 - 150 tons per day. This low production rate was primarily due to increased moisture content in the contaminated soils related to snow and ice. The contractor predicts that they

could have cut 2 - 3 months off the schedule, saving up to $3 - $4 million dollars, if they had constructed a facility to enclose the contaminated soil pile from the winter weather. Therefore, it is recommended that low thermal desorption treatment processes implemented in areas affected by winter climates consider constructing a facility to enclose the contaminated soil piles. An enclosure would also serve to contain VOC and Dust emissions from the piles.

REMEDIAL ACTION MANAGEMENT STRUCTURE

14) The source control remedial action at the ReSolve Superfund Site is considered a significant success story. A major contribution towards the success of this project is the responsible parties organization structure, and the quality of the personnel working on the project. First, EPA entered into a consent decree to conduct a source control (SC) and management of migration (MOM) remedy with 56 Settling Parties. The Settling Defendants decided to hire one attorney to serve as their Executive Coordinator. The attorney would coordinate information, money, progress and problems with the 56 Settling Parties. During the Consent Decree negotiations, EPA required the Settling Parties to hire an independent environmental consultant to oversee the RD/RA of the two operable units. While the Settling Defendants initially opposed the requirement, they quickly became aware of the environmental consultant's value to the project. At first, the environmental consultant's role was limited, but as schedules, document submittals, and contractor disagreements began to compromise the Settling Defendants RD progress, the environmental consultants role increased to reporting directly to the executive coordinator, coordinating technical issues with EPA, and overseeing the SC and MOM contractors. Examples of the environmental contractors valuable contributions include: preparing specifications, evaluating bid proposals, recommending contractors, organizing contractors, reviewing design plans, resolving any disputes between the two operable unit contractors, keeping the contractors on schedule, managing contractor change orders and discrepancies with the design specifications, overseeing construction progress and costs, etc,. The environmental contractor was EPA's lead contact for RD/RA issues. EPA contacted the Executive Coordinator to discuss major issues (e.g. non-compliance, public relations, etc.). EPA's contractor provided full-time oversight of the SC contractor. EPA discussed RD/RA issues with all contractors during monthly and sometimes by-weekly meetings on-site. The organizational flow diagram for the site was as follows:

DRAFT DOCUMENT - DO NOT QUOTE OR CITE



It is highly recommended that the PRP Steering Committee hire an Executive Coordinator to report to them RD/RA progress, and an independent environmental consultant to coordinate technical aspects of the RD/RA process. This organization structure was extremely successful at the ReSolve Superfund Site.

15) There is a significant benefit with PRP Lead RD/RA, other than costs. This benefit is that the PRPs have effective mechanisms for dealing with the abutting land owners to secure access. The PRPs have the ability to negotiate with the abutters, producing a desirable outcome for them, and minimizing delays in the PRP Lead RD/RA schedule. The Agency does not have the same mechanisms of negotiation to facilitate access with the abutting land owners.

As-Built Maps

1) Post-Excavation Topographic Plan,
Waste Management Area - Phase 2,
(Excluding North Access Road),
Dated 5/25/95.

2) Post-Excavation Sampling,
Waste Management Area - Phase 2,
(Excluding North Access Road),
Dated 5/25/95.

3) Post-Excavation Topographic Plan,
North Access Road Area,
(Part of Phase 2),
Dated 6/8/95.

4) Post-Excavation Sampling,
North Access Road Area,
(Part of Phase 2),
Dated 6/8/95.

5) Post-Excavation Topographic Plan,
Bin Area,
Dated 5/25/95,
Revised 1/15/96.

6) Post-Excavation Sampling,
Bin Area,
Dated 5/25/95,
Revised 1/15/96.

7) Post-Excavation Topographic Plan,
Waste Management Area - Phase 3,
Dated 5/25/95.

8) Post-Excavation Sampling,
Waste Management Area - Phase 3,
Dated 5/25/95,
Revised 1/15/96.

9) Pre-Excavation Sampling,
South GAP Area,
Dated 5/25/95,
Revised 1/15/96.

10) Post-Excavation Topographic Plan,
Waste Management Area - Phases 4,5,& 6,
Dated 5/25/95,
Revised 1/15/96.

11) Post-Excavation Sampling,
Waste Management Area - Phases 4,5,& 6,
Sheet No. 1 of 2,
Dated 5/25/95,
Revised 1/15/96.

12) Post-Excavation Sampling,
Waste Management Area - Phases 4, 5, & 6,
Sheet No. 2 of 2,
Dated 8/12/94,
Revised 1/15/96.

13) Post-Excavation Topographic Plan,
Waste Management Area - Phase 7,
Dated 5/25/95.

14) Post-Excavation Sampling,
Waste Management Area - Phase 7,
Dated 5/25/95,
Revised 1/16/96.

15) Topographic Post-Excavation Plan,
North Wetlands Remedial Area,
Dated 5/25/95,
Revised 1/15/96.

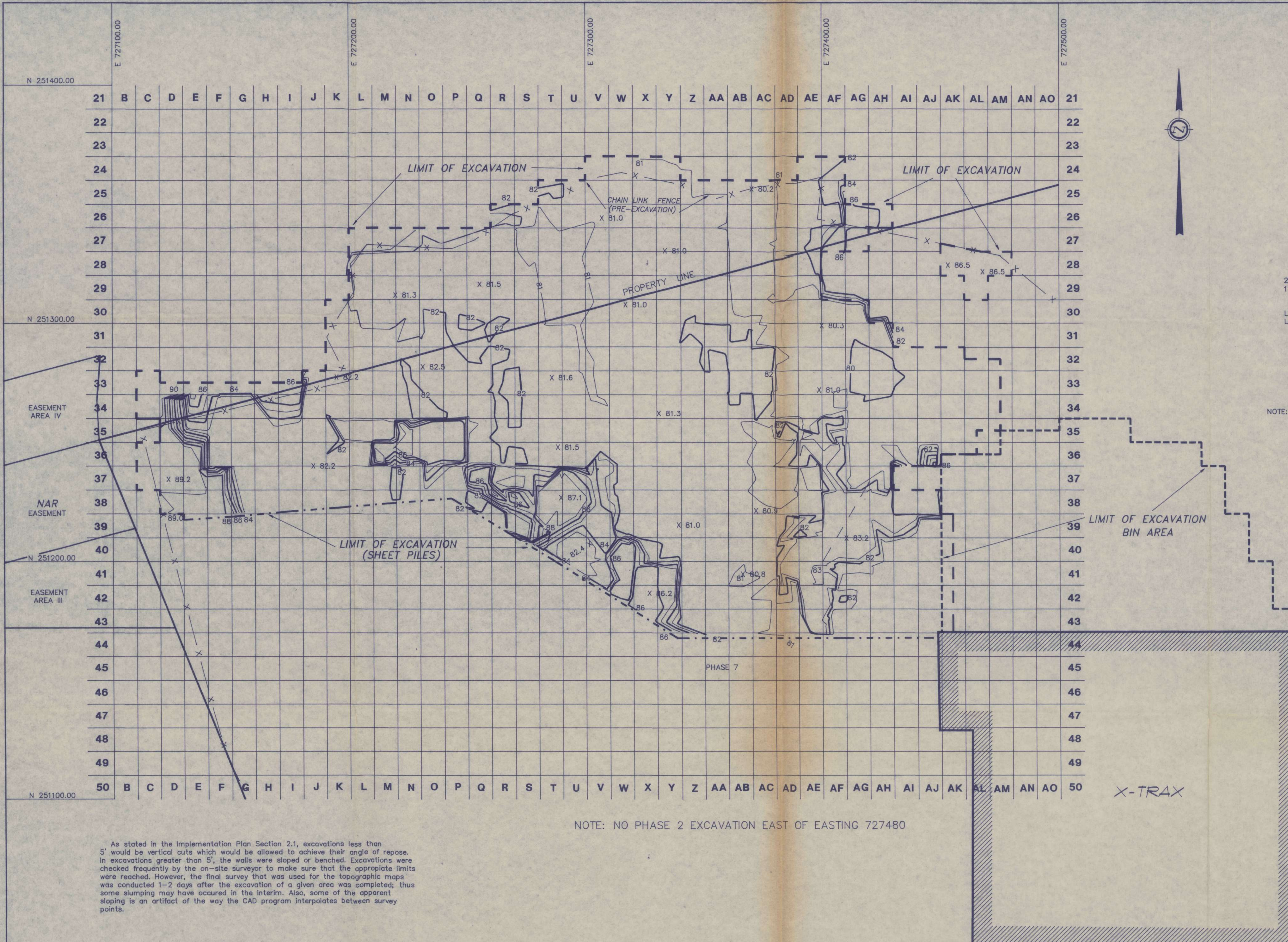
16) Topographic Post-Excavation Plan,
East Wetlands Remedial Area,
Dated 5/25/95.

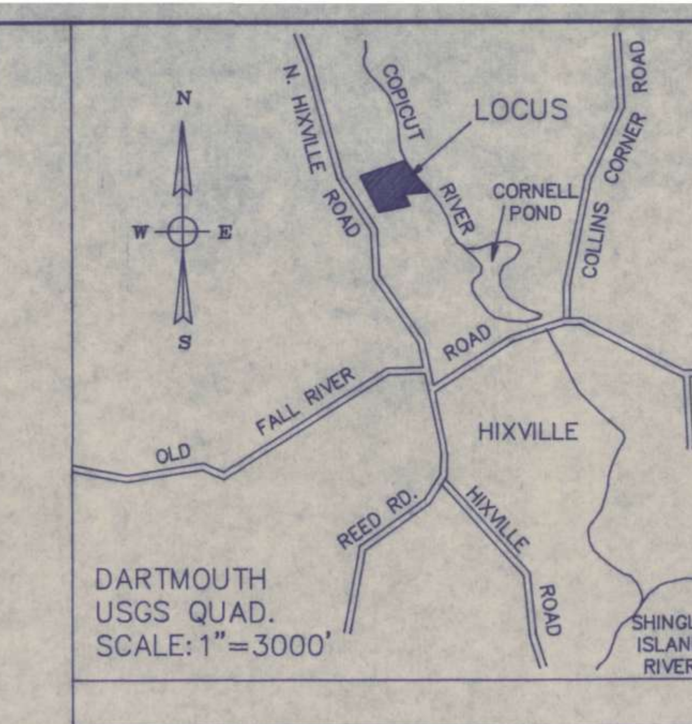
17) Pre-Excavation Sampling,
North Wetlands Remedial Area,
Dated 5/25/95,
Revised 1/15/96.

18) Pre & Post-Excavation Sampling,
East Wetlands Remedial Area,
Dated 5/25/95,
Revised 1/16/96.

19) Site Topographic Plan,
Sub-Grades,
Pre-Gravel Installation,
Dated 6/7/95,
Revised 9/22/95.

20) Site Topographic Plan,
Existing Finish Grades,
Dated 2/28/95,
Revised 1/15/96.





LEGEND

CHAIN LINK FENCE	—x—x—
2' INTERVAL CONTOUR	80
1' INTERVAL CONTOUR	81
SPOT ELEVATION	X 86.5
SHEET PILES	
LIMIT OF EXCAVATION	
LIMIT OF EXCAVATION (BINAREA)	
PROPERTY LINE	

NOTE: The Limits of Excavation for the Bin Area and Phase 2 overlap. The Bin Area was excavated first. The need to maintain a slope along the Western limit prevented excavation of all the contaminated material in this area. The excavation was completed as part of Phase 2 after sheetpiling was installed.

NOTE: NO PHASE 2 EXCAVATION EAST OF EASTING 727480

As stated in the Implementation Plan Section 2.1, excavations less than 5' would be vertical cuts which would be allowed to achieve their angle of repose. In excavations greater than 5', the walls were sloped or benched. Excavations were checked frequently by the on-site surveyor to make sure that the appropriate limits were reached. However, the final survey that was used for the topographic maps was conducted 1-2 days after the excavation of a given area was completed; thus some slumping may have occured in the interim. Also, some of the apparent sloping is an artifact of the way the CAD program interpolates between survey points.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION AND THAT THE CONTOURS WERE CREATED BY DIGITAL TERRAIN MODULE SOFTWARE.

6-30-95

COMMONWEALTH OF MASSACHUSETTS DANIEL A MOITZ No. 29279 PROFESSIONAL LAND SURVEYOR

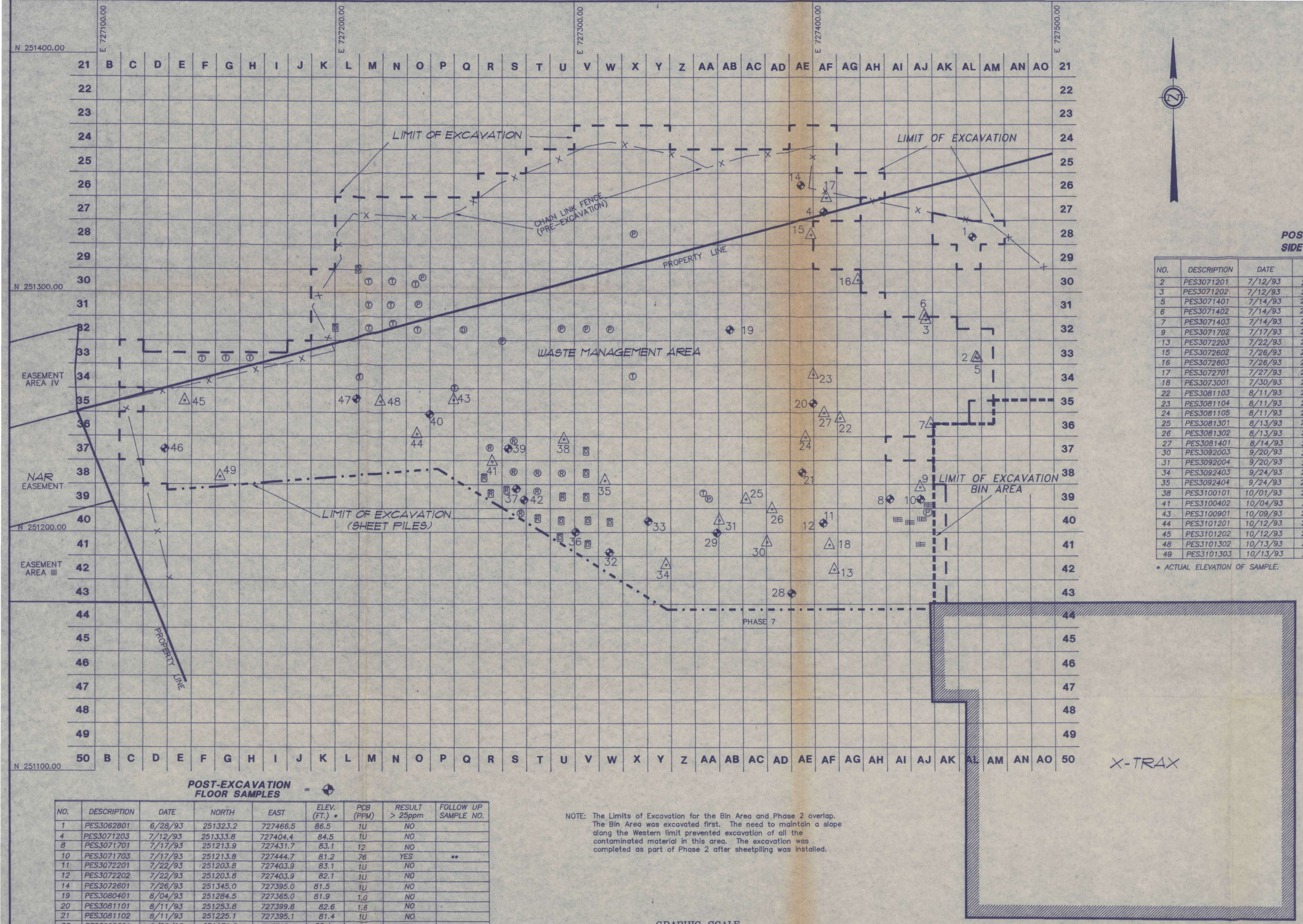
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE

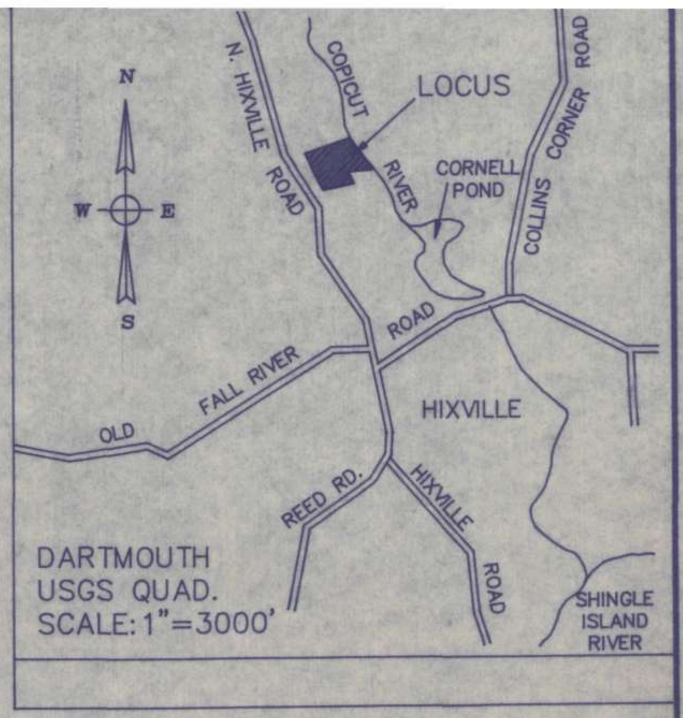
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

POST-EXCAVATION TOPOGRAPHIC PLAN
WASTE MANAGEMENT AREA - PHASE 2
(EXCLUDING NORTH ACCESS ROAD)

DANSON
SURVEYING & ENGINEERING CO.
201 MIDDLE STREET NEW BEDFORD, MA 02740

Scale:	Date:	Drawn:	Job No.	CHK. BY:
1" = 20'	5/25/95	DRP	94014	DAM
REV:		Drawing No.: 1113	PHASEII.DWG	Sheet No. 1 of 1

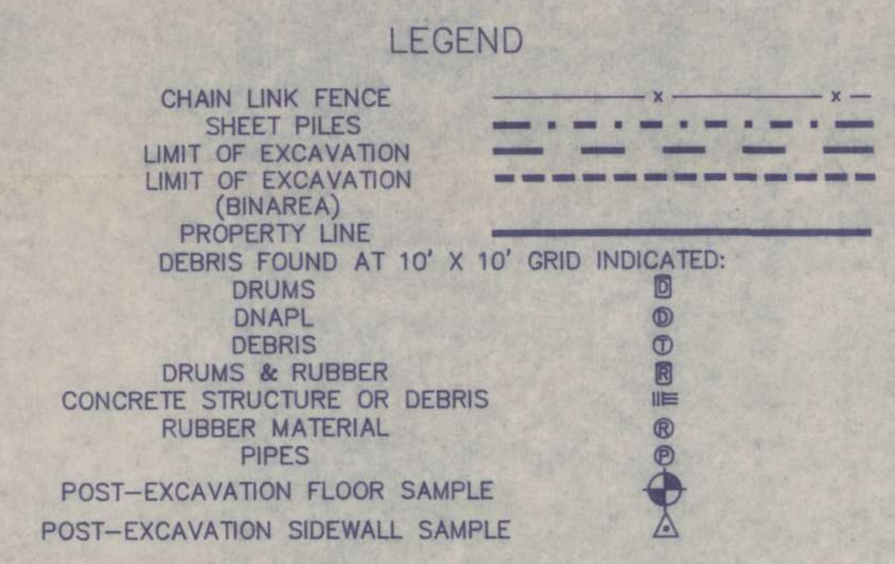




POST-EXCAVATION SIDEWALL SAMPLES = △

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
2	PES3071201	7/12/93	251273.0	727467.8	80.5	1U	NO	
3	PES3071202	7/12/93	251289.0	727447.0	80.2	1U	NO	
5	PES3071401	7/14/93	251272.7	727471.9	80.9	1U	NO	
6	PES3071402	7/14/93	251290.5	727446.8	80.5	1U	NO	
7	PES3071403	7/14/93	251245.1	727449.1	80.4	1U	NO	
9	PES3071702	7/17/93	251218.8	727444.7	82.6	9.9	NO	
13	PES3072203	7/22/93	251184.4	727408.5	82.5	43	YES	PES3073001
15	PES3072602	7/26/93	251325.0	727400.0	83.5	1U	NO	
16	PES3072603	7/26/93	251305.4	727419.0	81.0	1U	NO	
17	PES3072701	7/27/93	251330.0	727406.0	85.5	6.7	NO	
18	PES3073001	7/30/93	251194.9	727406.3	82.9	1U	NO	
22	PES3081103	8/11/93	251247.6	727411.2	81.0	1.1	NO	
23	PES3081104	8/11/93	251265.7	727399.9	82.3	6300	YES	PES3081401
24	PES3081105	8/11/93	251239.6	727396.6	81.9	5.2	NO	
25	PES3081301	8/13/93	251213.9	727371.6	82.3	180	YES	PES3092004
26	PES3081302	8/13/93	251210.0	727382.7	83.1	1U	NO	
27	PES3081401	8/14/93	251249.8	727404.4	83.0	1U	NO	
30	PES3092003	9/20/93	251196.1	727380.1	82.2	1.1	NO	
31	PES3092004	9/20/93	251205.0	727360.4	83.3	45	YES	PES3092002
34	PES3092403	9/24/93	251186.4	727337.8	82.7	1U	NO	
35	PES3092404	9/24/93	251221.5	727312.9	82.5	19	NO	
38	PES3100101	10/01/93	251239.0	727295.6	84.5	1U	NO	
41	PES3100402	10/04/93	251229.6	727265.9	85.4	1U	NO	
43	PES3100901	10/09/93	251255.3	727249.8	83.7	1U	NO	
44	PES3101201	10/12/93	251241.1	727234.6	84.0	21	NO	
45	PES3101202	10/12/93	251253.6	727136.9	84.0	1U	NO	
48	PES3101302	10/13/93	251254.8	727219.3	85.1	.077U	NO	
49	PES3101303	10/13/93	251223.2	727152.1	83.6	.081U	NO	

* ACTUAL ELEVATION OF SAMPLE.



POST-EXCAVATION FLOOR SAMPLES = ⯐

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
1	PES3062801	6/28/93	251323.2	727466.5	86.5	1U	NO	
4	PES3071203	7/12/93	251333.8	727404.4	84.5	1U	NO	
8	PES3071701	7/17/93	251213.9	727431.7	83.1	12	NO	
10	PES3071703	7/17/93	251213.8	727444.7	81.2	76	YES	**
11	PES3072201	7/22/93	251203.8	727403.9	83.1	1U	NO	
12	PES3072202	7/22/93	251203.8	727403.9	82.1	1U	NO	
14	PES3072601	7/26/93	251345.0	727395.0	81.5	1U	NO	
19	PES3080401	8/04/93	251284.5	727365.0	81.9	1.0	NO	
20	PES3081101	8/11/93	251253.8	727399.8	82.6	1.6	NO	
21	PES3081102	8/11/93	251225.1	727395.1	81.4	1U	NO	
28	PES3092001	9/20/93	251174.6	727390.4	80.4	27	YES	**
29	PES3092002	9/20/93	251199.8	727359.2	82.2	5800 J	YES	**
32	PES3092401	9/24/93	251191.6	727314.6	85.0	1U	NO	
33	PES3092402	9/24/933	251204.6	727330.6	82.1.	4.5	NO	
36	PES3092901	9/29/93	251200.2	727300.5	82.4	1U	NO	
37	PES3093001	9/30/93	251218.2	727275.9	87.3	32	YES	PES3100601
39	PES3100102	10/01/93	251234.9	727272.6	83.2	2800	YES.	**
40	PES3100401	10/04/93	251249.4	727239.7	86.2	1U	NO	
42	PES3100601	10/06/93	251213.5	727279.2	85.0	1.2	NO	
46	PES3101203	10/12/93	251234.7	727128.9	89.1	1U	NO	
47	PES3101301	10/13/93	251255.9	727209.1	82.9	.079U	NO	

* ELEVATION SHOWN IS NOMINAL SURFACE OF EXCAVATION AT TIME OF SURVEYING. SAMPLES EXTENDED TO 6" BELOW SURFACE.

** EXCAVATED TO SGL, NO FOLLOW UP SAMPLE REQUIRED.

NOTE: The Limits of Excavation for the Bin Area and Phase 2 overlap. The Bin Area was excavated first. The need to maintain a slope along the Western limit prevented excavation of all the contaminated material in this area. The excavation was completed as part of Phase 2 after sheetpiling was installed.

NOTE: NO PHASE 2 EXCAVATION EAST OF EASTING 727480

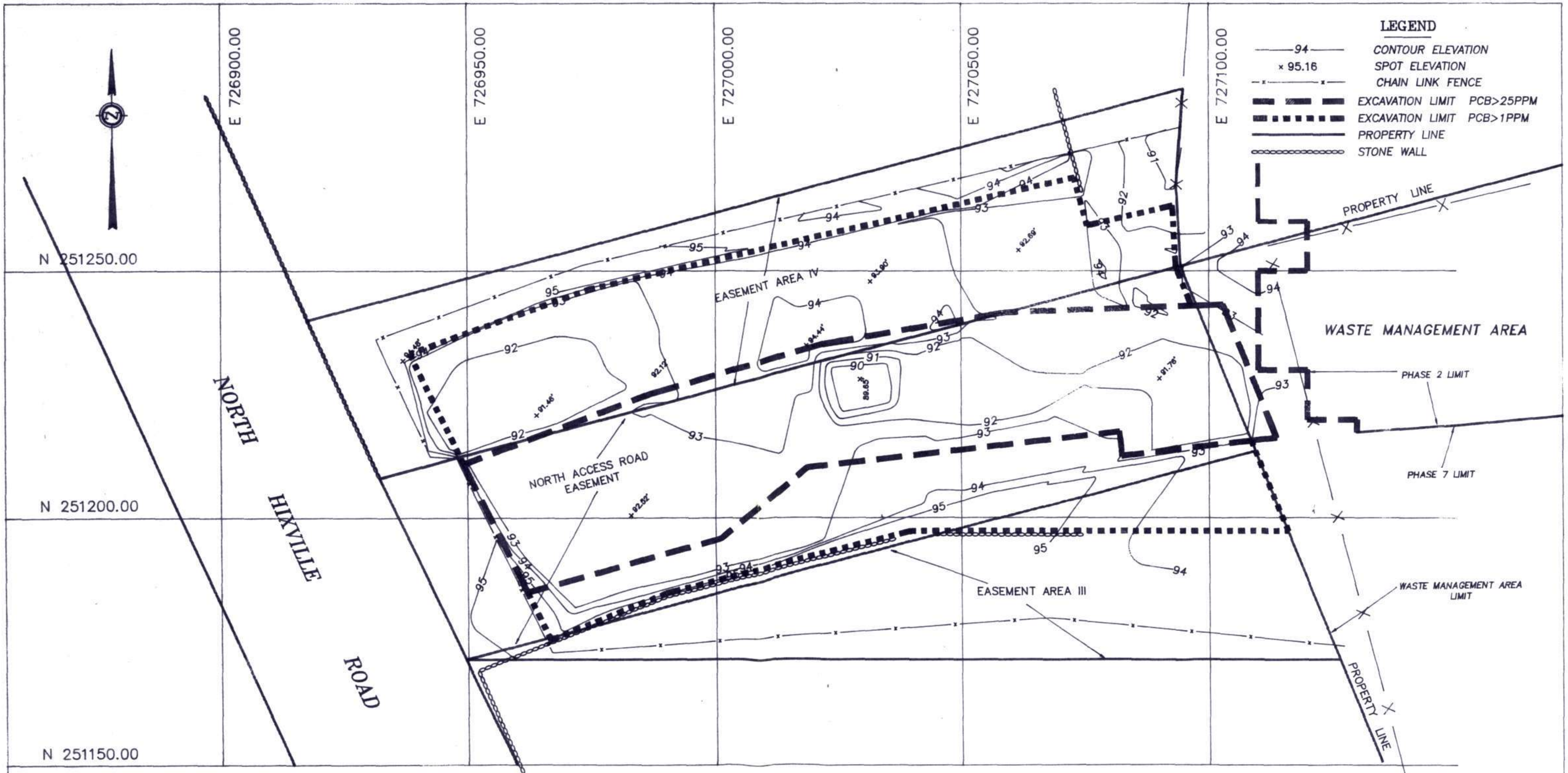
POST-EXCAVATION SAMPLING
WASTE MANAGEMENT AREA – PHASE 2
(EXCLUDING NORTH ACCESS ROAD)

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

COMMONWEALTH OF MASSACHUSETTS DANIEL A. MONIZ No. 29279 PROFESSIONAL LAND SURVEYOR

DANSON
SURVEYING & ENGINEERING CO.
201 MIDDLE STREET NEW BEDFORD, MA 02740

Scale:	Date:	Drawn:	Job No.	CHK. BY:
1" = 20'	5/25/95	DRP	94014	DAM
REV:		Drawing No.: 1116 RUSTPES1.DWG		Sheet No. 1 of 1



As stated in the Implementation Plan Section 2.1, excavations less than 5' would be vertical cuts which would be allowed to achieve their angle of repose. In excavations greater than 5', the walls were sloped or benched. Excavations were checked frequently by the on-site surveyor to make sure that the appropiate limits were reached. However, the final survey that was used for the topographic maps was conducted 1-2 days after the excavation of a given area was completed; thus some slumping may have occured in the interim. Also, some of the apparent sloping is an artifact of the way the CAD program interpolates between survey points.

GRAPHIC SCALE

10 0 10 20 40

(IN FEET)
1 inch = 20 ft.

The clean-up criterion for the NORTH ACCESS ROAD AREA was 25 ppm PCBs. Additional surface soil was excavated from the area designated on this map due to PCB concentrations greater then 1 ppm.

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE

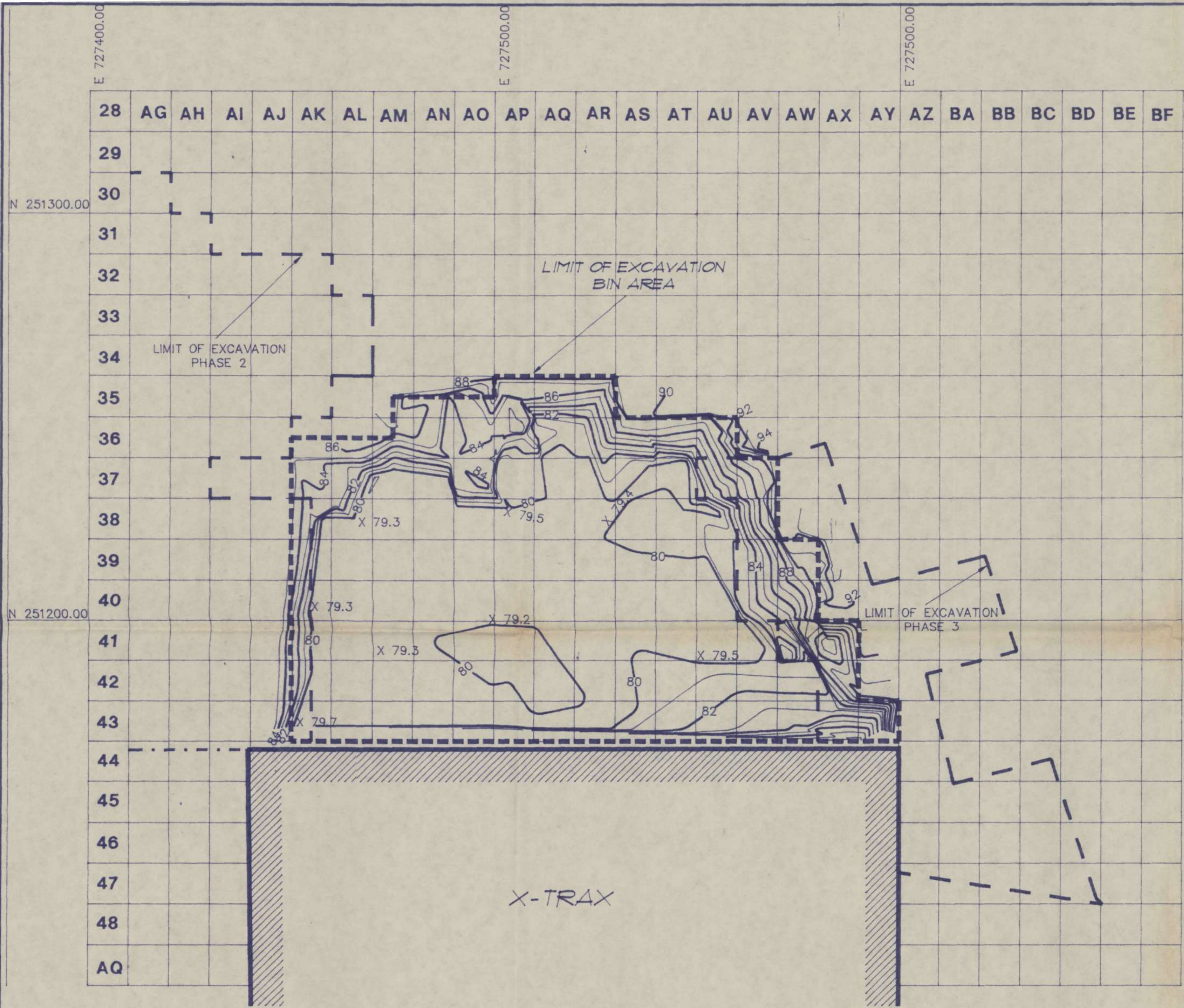
1275 N. HIXVILLE ROAD NO. DARTMOUTH, MA. 02740

COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ
No. 29279
PROFESSIONAL LAND SURVEYOR

JOB NO.:	92014
DRAWN:	CLC DRP
REVIEWED:	DAM
DATE:	6/8/95
DWG. #:	1182
CADD FILE:	ENR-POEX.DWG
SHEET:	1 of 1
SCALE:	1" = 20'

POST-EXCAVATION TOPOGRAPHIC PLAN
NORTH ACCESS ROAD AREA
(PART of PHASE 2)

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424



LEGEND

2' INTERVAL CONTOUR	80
1' INTERVAL CONTOUR	81
SPOT ELEVATION	X 86.5
SHEET PILES	
LIMIT OF EXCAVATION	
LIMIT OF EXCAVATION (PHASE 2 & PHASE 3)	

As stated in the Implementation Plan Section 2.1, excavations less than 5' would be vertical cuts which would be allowed to achieve their angle of repose. In excavations greater than 5', the walls were sloped or benched. Excavations were checked frequently by the on-site surveyor to make sure that the appropiate limits were reached. However, the final survey that was used for the topographic maps was conducted 1-2 days after the excavation of a given area was completed; thus some slumping may have occured in the interim. Also, some of the apparent sloping is an artifact of the way the CAD program interpolates between survey points.

I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.

18 JAN 96

NOTE: The Limits of Excavation for the Bin Area overlaps with Phase 2 & 3. The Bin Area was excavated first. The need to maintain a slope along the Eastern & Western limit prevented excavation of all the contaminated material in these area. The excavation was completed as part of Phase 2 & 3 after sheetpiling was installed.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

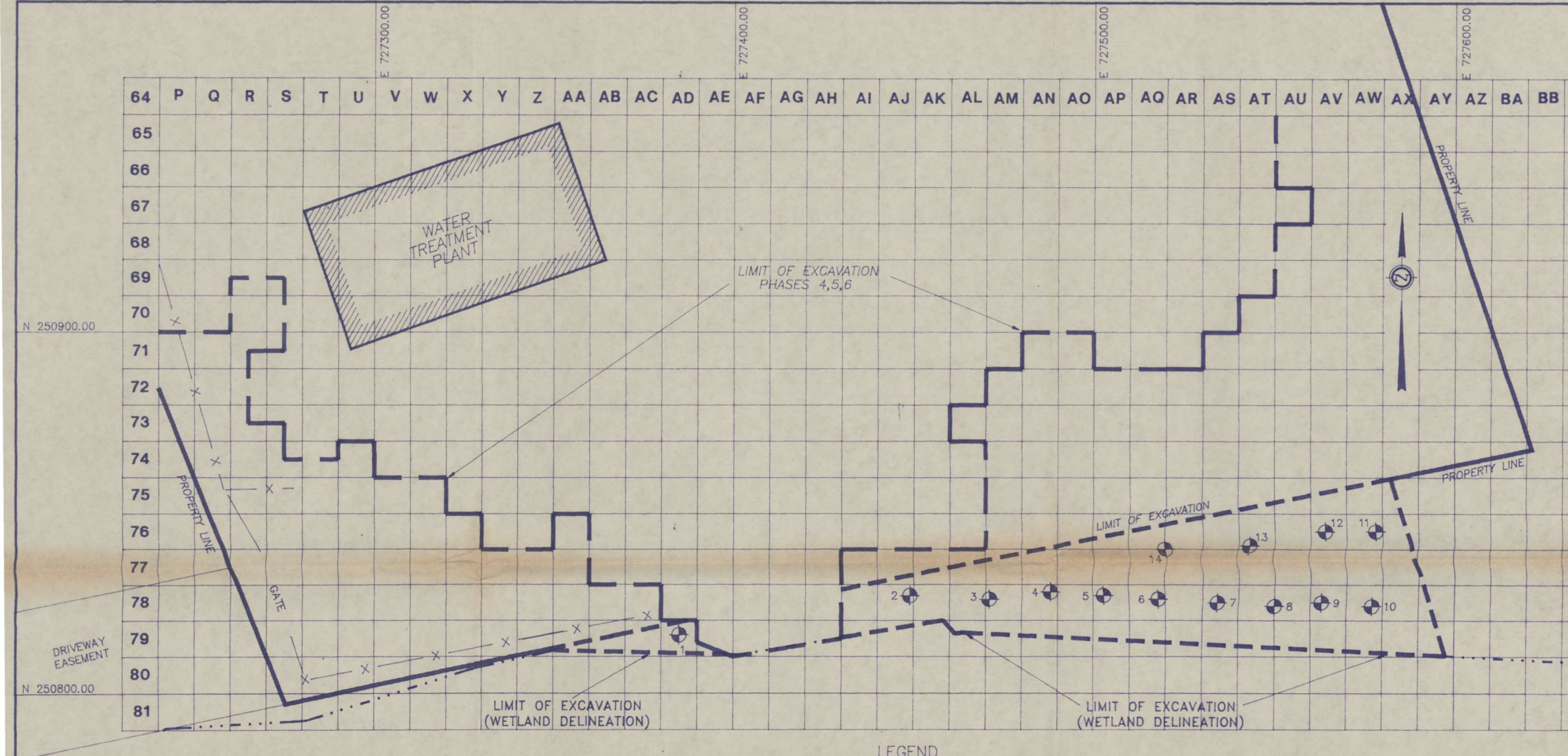
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ
No. 29271
PROFESSIONAL LAND SURVEYOR

JOB NO.:	94014
DRAWN:	DRP
REVIEWED:	DAM
DATE:	5/25/95
REVISED:	01/15/96
CADD FILE:	TOPOBIN.DWG
DWG. #	1201
SCALE:	1" = 20'

POST EXCAVATION TOPOGRAPHIC PLAN
BIN AREA

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424



PRE-EXCAVATION SAMPLES

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) ***	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
1	PES4062401	06/24/94	250815.7	727383.9	87.4	6.9	NO	*
2	PES4062402	06/24/94	250826.8	727447.8	87.2	<5	NO	**
3	PES4062403	06/24/94	250825.8	727472.2	86.9	7.7	NO	*
4	PES4062404	06/24/94	250827.8	727487.6	89.4	<5	NO	**
5	PES4062405	06/24/94	250827.3	727502.3	89.9	8.1	NO	*
6	PES4062406	06/24/94	250826.2	727518.3	89.2	3.7	NO	*
7	PES4062407	06/24/94	250825.1	727833.8	88.4	4.2	NO	*
8	PES4062408	06/24/94	250824.4	727549.9	88.0	<5	NO	**
9	PES4062409	06/24/94	250825.3	727562.8	87.7	2.9	NO	*
10	PES4062410	06/24/94	250824.2	727577.7	86.7	<5	NO	**
11	PES4062411	06/24/94	250844.9	727576.7	91.2	<5	NO	**
12	PES4062412	06/24/94	250845.0	727562.5	91.3	1.6	NO	*
13	PES4062413	06/24/94	250841.1	727542.1	90.5	<5	NO	**
14	PES4062414	06/24/94	250838.5	727515.9	90.3	<5	NO	**

* If ENSYS result was >5ppm, sample was sent to Laboratory for analysis.
** If ENSYS result was <5ppm, no further analysis was required.
*** SAMPLES EXTENDED TO 2' BELOW SURFACE.

LEGEND

CHAIN LINK FENCE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION (PHASE 4,5,6)
PROPERTY LINE
WETLAND DELINEATION
PRE-EXCAVATION SAMPLES

NOTE: This area was excavated to 2 ft. below grade as determined by Danson Surveying in the field at the time of excavation.

GRAPHIC SCALE
0 20 40 60
(IN FEET)
1 inch = 20 ft.

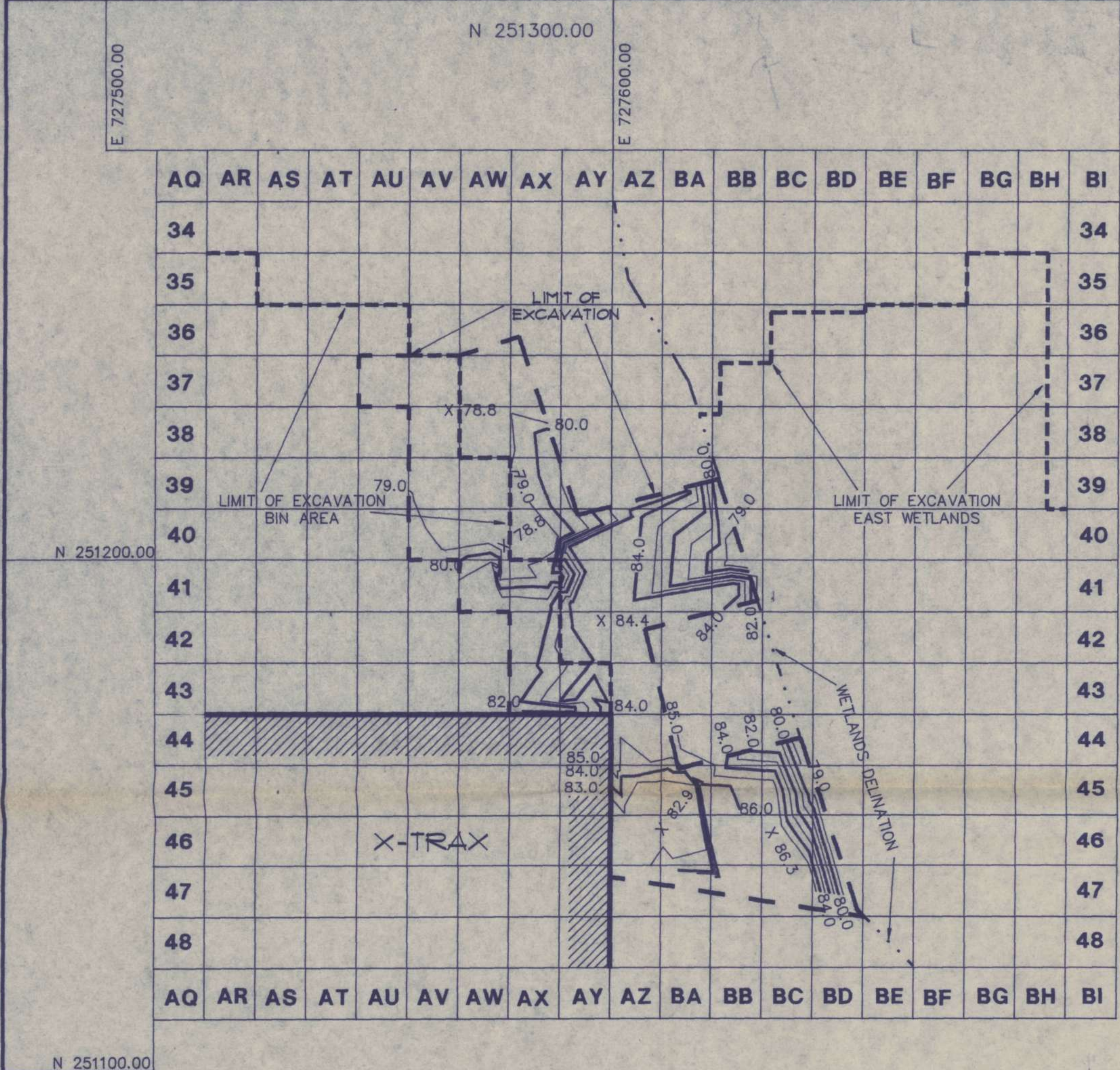
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 N> HIXVILLE ROAD NO. DARTMOUTH, MA. 02740

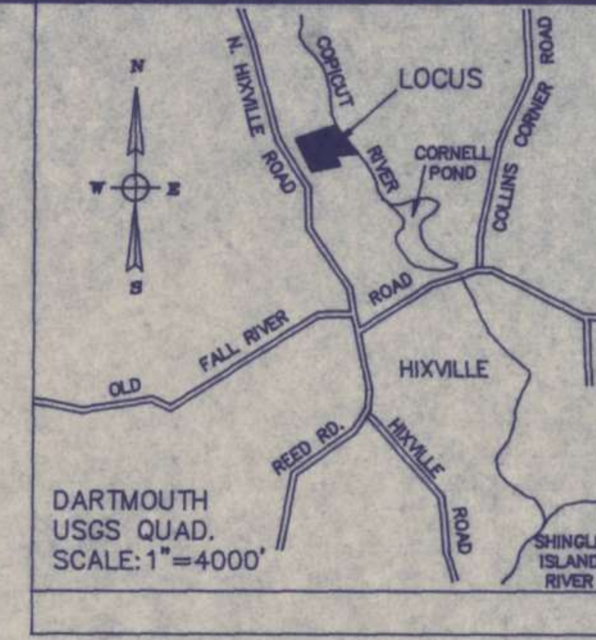
COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ
No. 292[illegible]
LAND SURVEYOR

JOB NO.:	94014
DRAWN:	DRP
REVIEWED:	DAM
DATE:	5/25/95
REVISED:	01/15/96
CADD FILE:	SOTHGAP.DWG
DWG. #	1185
SCALE:	1" = 20'

PRE-EXCAVATION SAMPLING
SOUTH GAP AREA

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424





LEGEND

LIMIT OF EXCAVATION	— — — —
LIMIT OF EXCAVATION (BINAREA)	- - - - - -
WETLAND DELINEATION	- · · - · · -
2' INTERVAL CONTOUR	—— 80 ——
1' INTERVAL CONTOUR	—— 81 ——
SPOT ELEVATION	X 86.5

NOTE: The Limits of Excavation for the Bin Area and Phase 3 overlap. The Bin Area was excavated first. The need to maintain a slope along the Eastern limit prevented excavation of all the contaminated material in this area. The excavation was completed as part of Phase 3 after sheetpiling was installed.

I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.

7 June 95

GRAPHIC SCALE

0 20 40 60

(IN FEET)
1 inch = 20 ft.

RUST REMEDIAL SERVICES INC.

RE–SOLVE SITE

1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ No. 29279
PROFESSIONAL LAND SURVEYOR

JOB NO.: 94014	POST–EXCAVATION TOPOGRAPHIC PLAN
DRAWN: DRP	WASTE MANAGEMENT AREA – PHASE 3
REVIEWED: DAM	
DATE: 5/25/95	
DWG. #: 1196	
CADD FILE: TOPOGAP.DWG	
SHEET: 1 of 1	
SCALE: 1" = 20	

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508–994–6989
FAX 508–991–4424

POST-EXCAVATION SIDEWALL SAMPLES = △

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
2	PES3113002	11/30/93	251032.0	727579.1	82.8	1U	NO	
3	PES3120101	12/01/93	250993.2	727571.7	81.9	1U	NO	
4	PES3120102	12/01/93	250979.6	727574.6	86.0	81	YES	PES3120803
5	PES3120103	12/01/93	250981.3	727565.8	82.9	1U	NO	
7	PES3120201	12/02/93	251019.3	727584.8	84.3	6.2	NO	
9	PES3120802	12/08/93	250951.9	727553.5	86.8	1U	NO	
10	PES3120803	12/08/93	250976.0	727577.2	86.6	24	NO	
11	PES3120901	12/09/93	251031.2	727569.9	79.4	8.6	NO	
13	PES3121003	12/10/93	251025.9	727530.2	84.8	7.8	NO	
14	PES3121301	12/13/93	250969.8	727539.1	81.0	1U	NO	
15	PES3121302	12/13/93	251026.2	727549.9	81.3	160	YES	PES3121601
16	PES3121401	12/14/93	251017.0	727538.6	80.6	1.2U	NO	
17	PES3121601	12/16/93	251024.6	727564.2	81.6	1U	NO	
18	PES3121701	12/17/93	250987.8	727519.9	81.2	1U	NO	
19	PES3122301	12/23/93	250970.9	727517.3	82.2	79	YES	PES4010303
21	PES3122303	12/23/93	250955.9	727487.7	84.8	1U	NO	
22	PES3122304	12/23/93	250987.1	727496.6	83.9	150	YES	PES4010302
24	PES3122306	12/23/93	251004.5	727479.0	85.3	130	YES	PES4010301
25	PES3122307	12/23/93	251010.7	727485.6	85.3	3.4	NO	
27	PES3122702	12/27/93	251019.5	727469.5	85.6	1U	NO	
28	PES4010301	01/03/94	251005.5	727472.1	85.5	1.1U	NO	
29	PES4010302	01/03/94	250995.7	727499.4	83.8	2.8	NO	
30	PES4010303	01/03/94	250969.1	727528.1	82.2	1.1U	NO	
31	PES4010304	01/03/94	250932.1	727559.1	86.1	1U	NO	
32	PES4010305	01/03/94	250916.7	727549.9	86.9	1U	NO	
33	PES4010306	01/03/94	250895.4	727529.5	87.4	1U	NO	
38	PES4011102	01/11/94	250844.2	727469.7	85.7	1U	NO	
40	PES4011202	01/12/94	250831.4	727429.0	87.7	1U	NO	
41	PES4011203	01/12/94	250850.0	727423.3	85.5	1U	NO	
42	PES4011204	01/12/94	250834.8	727417.1	85.5	1U	NO	
43	PES4011205	01/12/94	250830.4	727389.9	85.4	1U	NO	
44	PES4011701	01/17/94	250857.3	727394.5	87.3	7.5	NO	
45	PES4011702	01/17/94	250826.0	727380.3	87.1	5.1	NO	
46	PES4011703	01/17/94	250839.3	727375.2	86.8	4.9	NO	
47	PES4011704	01/17/94	250849.6	727358.7	87.8	6.9	NO	
50	PES4011707	01/17/94	250837.6	727335.5	87.5	1U	NO	
51	PES4011801	01/18/94	250862.7	727334.6	86.6	1UJ	NO	
53	PES4012002	01/20/94	250899.0	727488.1	86.6	1U	NO	
54	PES4012501	01/25/94	250876.2	727398.5	81.6	1U	NO	
55	PES4012502	01/25/94	250861.6	727430.5	81.4	1U	NO	
56	PES4012503	01/25/94	250875.1	727449.3	81.5	1U	NO	
57	PES4012504	01/25/94	250891.8	727464.7	81.6	1U	NO	
59	PES4012802	01/28/94	250909.2	727439.6	82.8	1U	NO	
68	PES4020208	02/02/94	250860.8	727307.9	87.8	1U	NO	
69	PES4020209	02/02/94	250889.7	727350.7	86.7	180	YES	PES4020703
70	PES4020301	02/03/94	250910.3	727415.0	81.8	1U	NO	
71	PES4020302	02/03/94	250927.4	727460.6	83.5	1U	NO	
73	PES4020702	02/07/94	250961.1	727441.5	87.4	1U	NO	
74	PES4020703	02/07/94	250884.8	727355.4	86.7	1.2	NO	
75	PES4020704	02/07/94	250900.5	727379.1	85.5	1U	NO	
79	PES4021002	02/10/94	250927.7	727372.0	83.8	1U	NO	
83	PES4021902	02/19/94	250966.3	727430.2	86.2	4.6	NO	
84	PES4021903	02/19/94	250962.9	727418.8	82.4	1U	NO	
85	PES4021904	02/19/94	250934.1	727410.9	84.8	1U	NO	
86	PES4022201	02/22/94	251029.1	727455.8	85.2	1U	NO	
88	PES4022302	02/23/94	251020.9	727436.8	85.4	1U	NO	
93	PES4022605	02/26/94	251022.4	727437.8	85.6	13	NO	
94	PES4030101	03/01/94	250900.1	727254.4	90.4	1U	NO	
97	PES4030401	03/04/94	251023.2	727438.1	86.5	3.9J	NO	
99	PES4031401	03/14/94	251023.0	727440.0	86.5	6.8	NO	
100	PES4031701	03/17/94	250951.6	727395.1	83.8	7.4	NO	
102	PES4032101	03/21/94	250966.7	727418.6	83.9	7.1J	NO	
103	PES4032102	03/21/94	251005.8	727444.4	84.6	1U	NO	
104	PES4032103	03/21/94	251028.2	727415.6	81.9	1U	NO	
105	PES4032104	03/21/94	250880.7	727277.2	86.5	44	YES	PES4032902
106	PES4032105	03/21/94	250899.4	727277.4	86.0	460J	YES	PES4033003
107	PES4032106	03/21/94	250920.0	727260.0	86.5	132	YES	PES4033002
109	PES4032108	03/21/94	250948.7	727256.9	85.9	1U	NO	
112	PES4032115	03/21/94	250979.6	727345.5	81.5	1U	NO	
114	PES4032902	03/29/94	250873.3	727273.1	86.2	1.4	NO	
116	PES4033002	03/30/94	250917.6	727254.7	86.6	15	NO	
117	PES4033003	03/30/94	250900.4	727271.8	86.6	4	NO	
119	PES4040701	04/07/94	251022.4	727363.2	81.6	1U	NO	
120	PES4040702	04/07/94	251036.6	727360.4	85.0	7.5	NO	
121	PES4041201	04/12/94	251031.2	727367.8	81.7	1U	NO	
122	PES4051601	05/16/94	250980.2	727310.4	84.9	0.2U	NO	
123	PES4051602	05/16/94	251021.7	727343.3	83.2	0.2U	NO	
124	PES4051603	05/16/94	250996.9	727306.5	85.9	1.2	NO	
126	PES4051801	05/18/94	250985.6	727259.8	86.4	7.6	NO	
127	PES4051802	05/18/94	250979.8	727234.9	88.7	0.2U	NO	
131	PES4052301	05/23/94	251000.4	727234.0	87.1	0.2U	NO	
134	PES4052304	05/23/94	251015.7	727330.9	83.5	0.2U	NO	
137	PES4052401	05/24/94	250999.1	727271.6	85.0	190	YES	PES4052801
138	PES4052402	05/24/94	251019.5	727259.6	82.8	0.2U	NO	
139	PES4052403	05/24/94	251014.7	727250.1	86.0	0.2U	NO	
141	PES4052801	05/28/94	250994.0	727274.8	84.1	1.2U	NO	
143	PES4060606	06/06/94	251031.4	727349.7	81.7	1.7	NO	

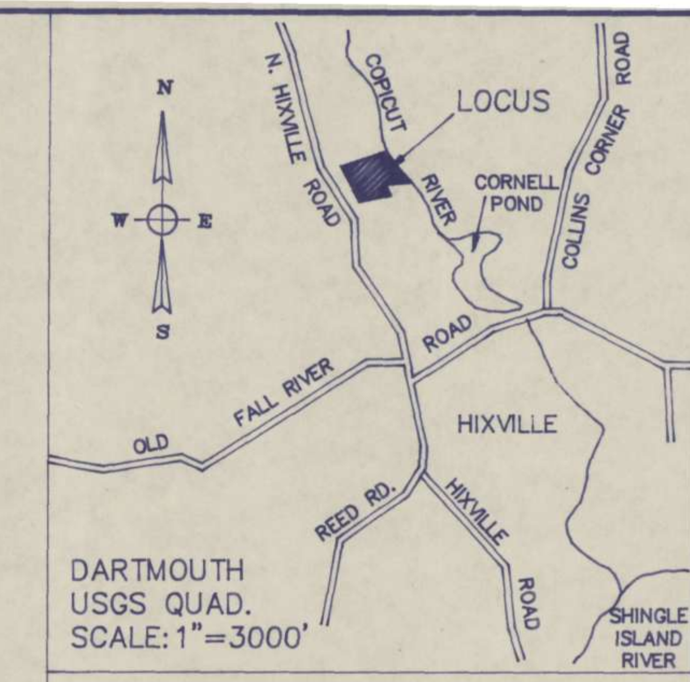
* ACTUAL ELEVATION OF SAMPLE.

POST-EXCAVATION FLOOR SAMPLES = ⊕

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
1	PES3113001	11/30/93	251018.4	727571.7	83.0	1U	NO	
6	PES3120104	12/01/93	250984.5	727574.4	84.8	1U	NO	
8	PES3120801	12/08/93	250962.4	727532.4	81.7	1.5	NO	
12	PES3121002	12/10/93	251029.9	727538.7	80.0	63	YES	**
20	PES3122302	12/23/93	250972.3	727507.8	81.2	1.3U	NO	
23	PES3122305	12/23/93	250998.3	727494.4	84.1	1U	NO	
26	PES3122701	12/27/93	251029.9	727469.6	83.9	1U	NO	
34	PES4010307	01/03/94	250917.0	727525.8	85.1	1U	NO	
35	PES4010401	01/04/94	250931.6	727488.0	84.1	1U	NO	
36	PES4010501	01/05/94	251022.1	727502.4	85.4	1U	NO	
37	PES4011101	01/11/94	250859.1	727452.3	84.4	1U	NO	
39	PES4011201	01/12/94	250835.7	727403.8	86.4	1U	NO	
48	PES4011705	01/17/94	250855.0	727363.6	86.7	3.4	NO	
49	PES4011706	01/17/94	250835.5	727365.2	88.8	1U	NO	
52	PES4012001	01/20/94	250884.8	727383.8	87.5	2.9	NO	
58	PES4012801	01/28/94	250917.9	727460.5	85.4	1.5	NO	
60	PES4012803	01/28/94	250952.5	727468.9	85.7	1U	NO	
61	PES4020201	02/02/94	250876.2	727305.3	84.2	1U	NO	
62	PES4020202	02/02/94	250879.9	727317.8	84.5	1U	NO	
63	PES4020203	02/02/94	250883.0	727327.6	84.4	1U	NO	
64	PES4020204	02/02/94	250886.3	727335.6	84.4	1U	NO	
65	PES4020205	02/02/94	250889.8	727345.3	84.2	1U	NO	
66	PES4020206	02/02/94	250893.0	727354.0	84.3	1U	NO	
67	PES4020207	02/02/94	250894.3	727364.2	85.6	1.7	NO	
72	PES4020701	02/07/94	250939.3	727440.7	82.4	1U	NO	
76	PES4020801	02/08/94	250916.2	727395.7	83.7	1U	NO	
77	PES4020802	02/08/94	250924.8	727375.3	84.3	4.4	NO	
78	PES4021001	02/10/94	250933.2	727376.1	82.4	1U	NO	
80	PES4021401	02/14/94	250990.6	727460.1	87.2	6.5J	NO	
81	PES4021501	02/15/94	250954.1	727420.7	80.8	1.1	NO	
82	PES4021901	02/19/94	250963.7	727424.0	83.9	15	NO	
87	PES4022301	02/23/94	250995.3	727426.9	81.3	1U	NO	
89	PES4022601	02/26/94	250919.8	727283.8	85.1	1.7	NO	
90	PES4022602	02/26/94	250915.4	727255.6	87.3	1.6	NO	
101	PES4031801	03/18/94	250961.3	727309.8	84.7	16	NO	
110	PES4032109	03/21/94	250877.1	727292.5	85.2	1U	NO	
111	PES4032110	03/21/94	250945.6	727267.9	84.8	159	YES	PES4033001
113	PES4032401	03/24/94	251036.4	727455.2	85.1	12	NO	
115	PES4033001	03/30/94	250945.0	727265.0	83.5	34	YES	PES4033106
118	PES4033106	03/31/94	250945.6	727262.1	82.2	7.7	NO	
125	PES4051604	05/16/94	251005.6	727311.6	82.2	0.2U	NO	
130	PES4051805	05/18/94	250974.8	727264.7	85.3	0.2U	NO	
135	PES4052305	05/23/94	250995.2	727285.0	83.2	0.2U	NO	
136	PES4052306	05/23/94	251032.1	727229.6	85.5	0.2U	NO	
140	PES4052404	05/24/94	251018.4	727213.8	91.0	140	YES	PES4052802
142	PES4052802	05/28/94	251030.3	727209.1	88.0	1.2U	NO	

* ELEVATION SHOWN IS NOMINAL SURFACE OF EXCAVATION AT TIME OF SURVEYING. SAMPLES EXTENDED TO 6" BELOW SURFACE.

** EXCAVATED TO SGL, NO FOLLOW UP SAMPLE REQUIRED.



POST-EXCAVATION SLOPE SAMPLES = ⊙

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
91	PES4022603	02/26/94	250901.8	727250.0	90.7	1U	NO	
92	PES4022604	02/26/94	250927.1	727244.9	89.6	87	YES	PES4030201
95	PES4030201	03/02/94	250923.0	727242.4	89.7	153	YES	PES4030501
96	PES4030202	03/02/94	250942.6	727240.2	88.5	9.2J	NO	
98	PES4030501	03/05/94	250920.8	727239.1	89.4	3.8J	NO	
108	PES4032107	03/21/94	250907.2	727245.4	90.5	1U	NO	
128	PES4051803	05/18/94	250964.5	727238.4	88.4	0.2U	NO	
129	PES4051804	05/18/94	250975.3	727229.9	89.4	0.2U	NO	
132	PES4052302	05/23/94	251011.3	727226.7	86.4	0.2U	NO	
133	PES4052303	05/23/94	251025.8	727219.0	86.6	0.2U	NO	

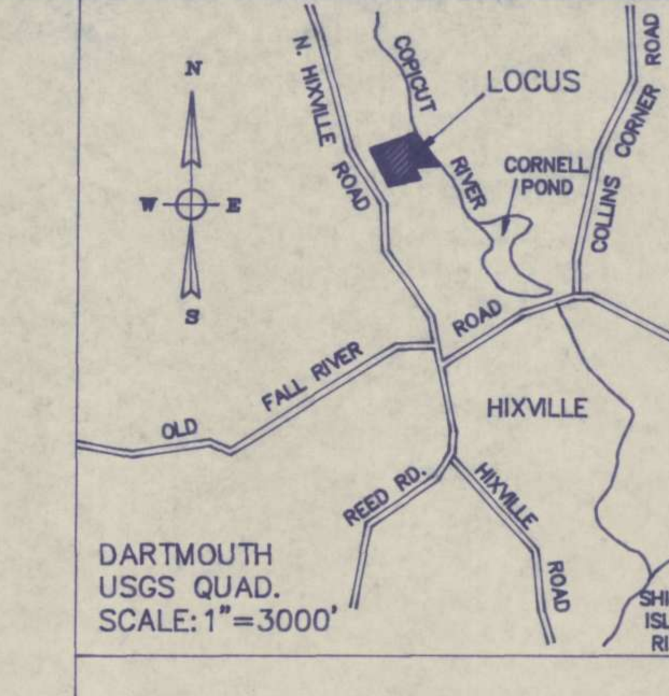
* ACTUAL ELEVATION OF SAMPLE.

POST-EXCAVATION SAMPLING
WASTE MANAGEMENT AREA – PHASES 4,5,&

RUST REMEDIAL SERVICES, INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

DANSON
SURVEYING & ENGINEERING CO.
201 MIDDLE STREET NEW BEDFORD, MA 0274

Scale: 1" = 20'	Date: 08/12/94	Drawn: DRP	Job No. 94014	CHK. BY: DA
REV: 01/15/96		Drawing No.: 1194 PH4PES.DWG		Sheet No. 2 of



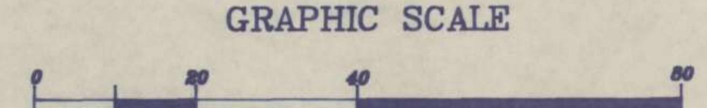
NOTE: 1.) Excavation along West Property Line was sloped within the shaded area.

LEGEND

CHAIN LINK FENCE
LIMIT OF EXCAVATION
PROPERTY LINE
WETLAND DELINEATION
DEBRIS FOUND WITHIN 10' X 10' GRID INDICATED:
DNAPL
DNAPL WELL
PIPES
POST-EXCAVATION FLOOR SAMPLE
POST-EXCAVATION SIDEWALL SAMPLE

Chain Link Fence along western property line was removed and a temporary chain link fence was erected outside of the excavation area.

GRAPHIC SCALE



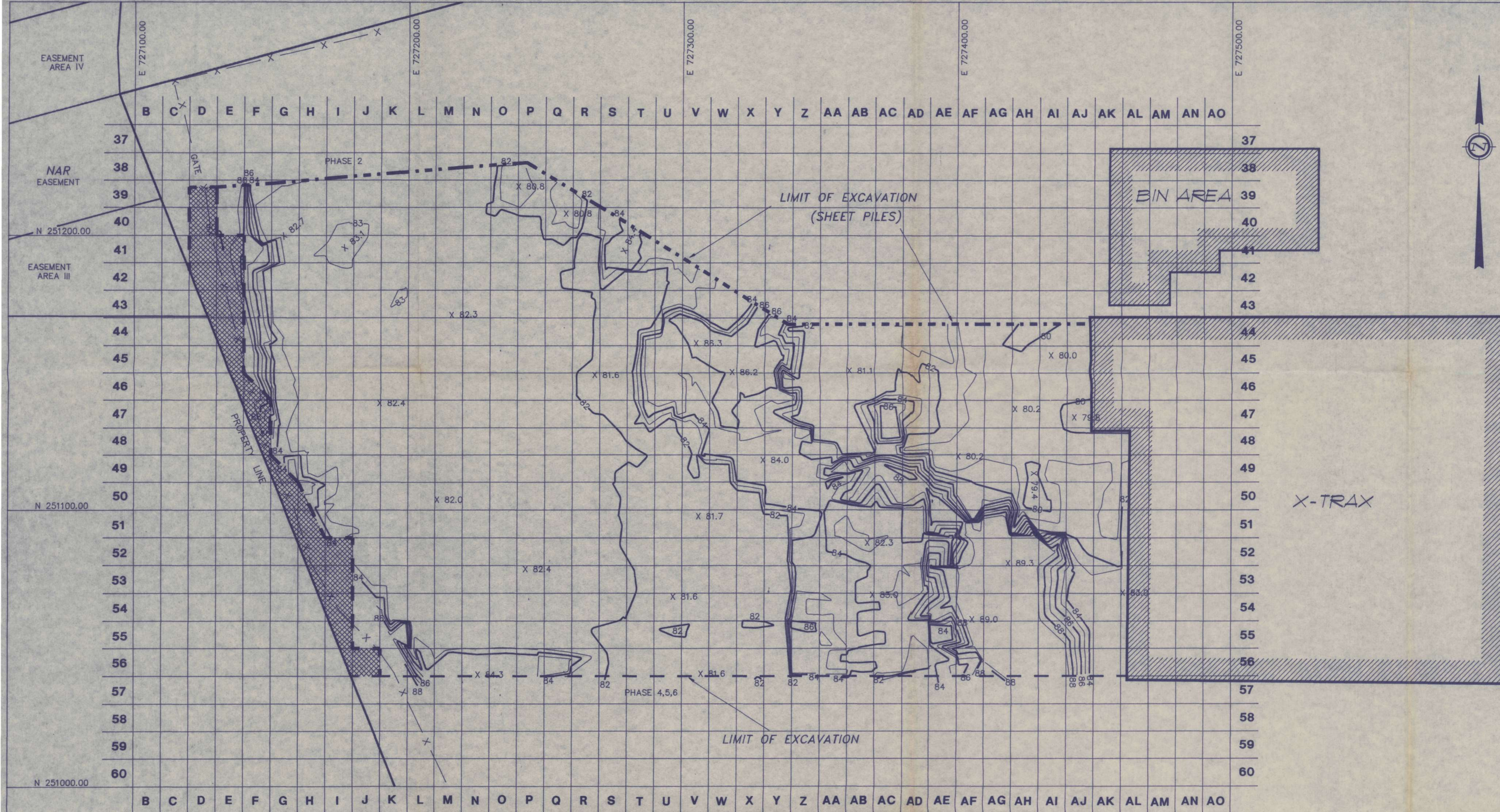
(IN FEET)
1 inch = 20 ft.

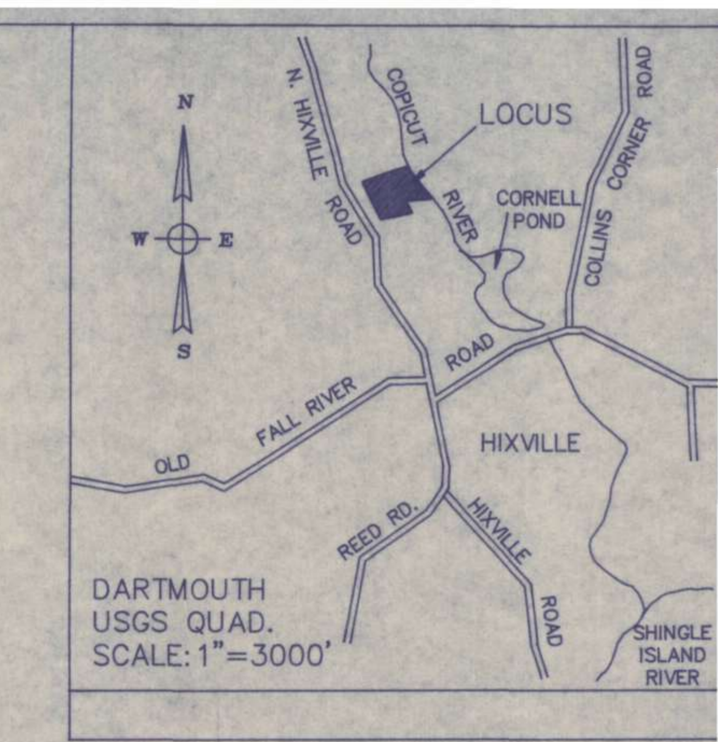
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

POST-EXCAVATION SAMPLING
WASTE MANAGEMENT AREA – PHASES 4,5,&6

DANSON
SURVEYING & ENGINEERING CO.
261 MIDDLE STREET NEW BEDFORD, MA 02740

Scale: 1" = 20'	Date: 5/25/95	Drawn: DRP	Job No. 94014	CHK. BY: DAM
REV: 01/15/96		Drawing No.: 1194 PH4PES.DWG		Sheet No. 1 of 2





LEGEND

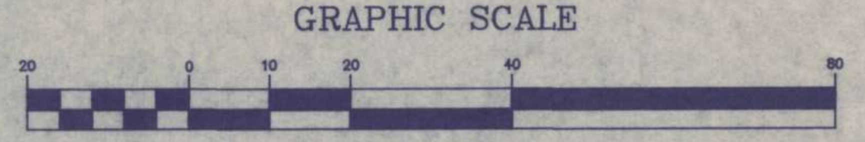
CHAIN LINK FENCE
2' INTERVAL CONTOUR — 80
1' CONTOUR LINE — 81
SPOT ELEVATION — X 80.5
SHEET PILES
LIMIT OF EXCAVATION
PROPERTY LINE

Chain Link Fence along western property line was removed and a temporary chain link fence was erected outside of the excavation area.

NOTE: 1.) Excavation along West Property Line was sloped within the shaded area.

2.) As stated in the Implementation Plan Section 2.1, excavations less than 5' would be vertical cuts which would be allowed to achieve their angle of repose. In excavations greater than 5', the walls were sloped or benched. Excavations were checked frequently by the on-site surveyor to make sure that the appropriate limits were reached. However, the final survey that was used for the topographic maps was conducted 1-2 days after the excavation of a given area was completed; thus some slumping may have occured in the interim. Also, some of the apparent sloping is an artifact of the way the CAD program interpolates between survey points.

GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.

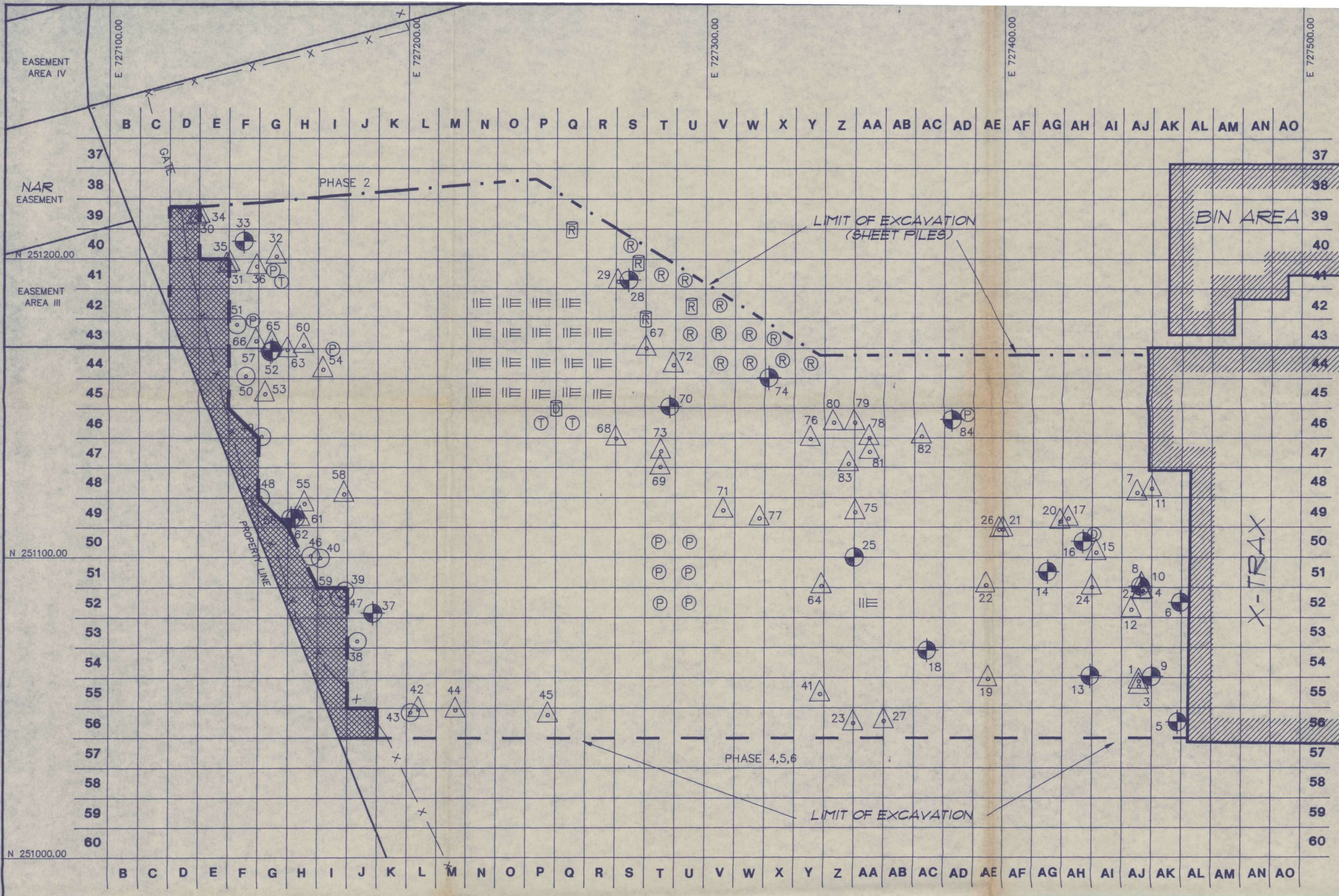
7 June 95

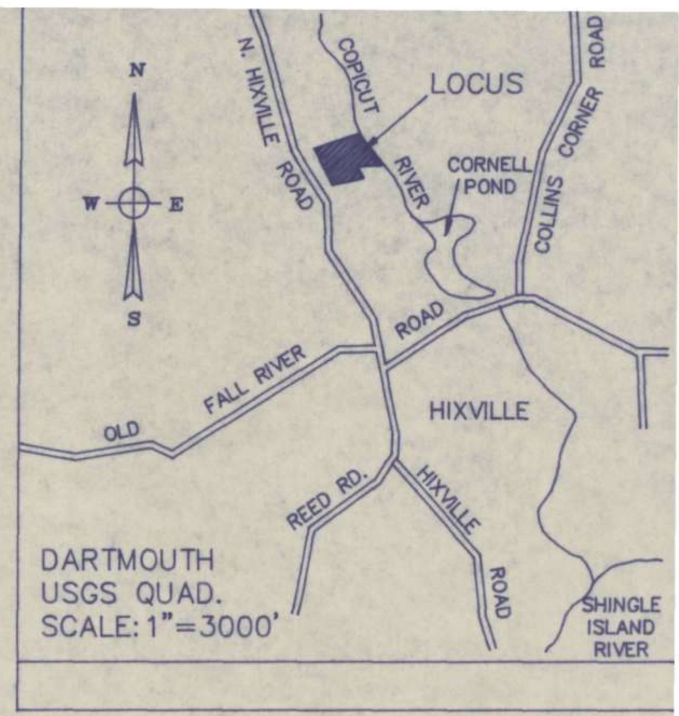
POST-EXCAVATION TOPOGRAPHIC PLAN
WASTE MANAGEMENT AREA - PHASE 7

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

DANSON
SURVEYING & ENGINEERING CO.
201 MIDDLE STREET NEW BEDFORD, MA 02740

Scale: 1" = 20'	Date: 5/25/95	Drawn: DRP	Job No. 94014	CHK. BY: DAM
REV:		Drawing No.: 1187 PHASE7.DWG		Sheet No. 1 of 1





LEGEND

- CHAIN LINK FENCE
- SHEET PILES
- LIMIT OF EXCAVATION
- PROPERTY LINE
- DEBRIS FOUND AT 10' X 10' GRID INDICATED:
  - DRUMS
  - DNAPL
  - DEBRIS
  - DRUMS & RUBBER
  - CONCRETE STRUCTURE OR CONCRETE DEBRIS
  - RUBBER MATERIAL
  - PIPES
- POST-EXCAVATION FLOOR SAMPLE
- POST-EXCAVATION SIDEWALL SAMPLE

Chain Link Fence along western property line was removed and a temporary chain link fence was erected outside of the excavation area.

NOTE: 1.) Excavation along West Property Line was sloped within the shaded area.

POST-EXCAVATION SIDEWALL SAMPLES = △

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
1	PES4030701	03/07/94	251058.8	727445.8	86.1	3.0J	NO	
2	PES4030702	03/07/94	251088.6	727446.8	84.2	1U	NO	
3	PES4032111	03/21/94	251057.1	727445.8	85.4	1U	NO	
4	PES4032112	03/21/94	251088.9	727447.1	83.9	88	YES	PES4033006
7	PES4032801	03/28/94	251121.5	727445.1	81.9	140	YES	PES4033005
8	PES4032802	03/28/94	251090.8	727446.7	82.7	30	YES	PES4033006
11	PES4033005	03/30/94	251122.9	727450.0	82.2	200	YES	**
12	PES4033006	03/30/94	251082.6	727443.2	82.8	3.2	NO	
15	PES4033103	03/31/94	251101.5	727431.4	85.1	11	NO	
17	PES4033105	03/31/94	251113.8	727422.4	81.6	12	NO	
19	PES4040402	04/04/94	251059.6	727394.9	85.0	1U	NO	
20	PES4040403	04/04/94	251111.9	727419.2	81.7	1U	NO	
21	PES4040404	04/04/94	251109.3	727400.1	86.4	31	YES	PES4041102
22	PES4040602	04/06/94	251090.8	727394.2	84.5	1U	NO	
23	PES4040603	04/06/94	251045.0	727350.0	85.6	17	NO	
24	PES4040801	04/08/94	251090.0	727430.0	81.5	1.1U	NO	
26	PES4041102	04/11/94	251109.1	727398.8	82.4	1U	NO	
27	PES4041202	04/12/94	251045.0	727360.0	85.0	1U	NO	
29	PES4042902	04/29/94	251192.4	727270.8	83.8	0.69	NO	
30	PES4050401	05/04/94	251214.1	727129.2	91.4	0.1U	NO	
31	PES4050402	05/04/94	251197.9	727139.3	89.4	0.1U	NO	
32	PES4050403	05/04/94	251201.4	727156.1	84.6	1200	YES	PES4051003
34	PES4051001	05/10/94	251214.1	727129.4	90.5	1U	NO	
35	PES4051002	05/10/94	251197.7	727139.4	88.6	1U	NO	
36	PES4051003	05/10/94	251197.4	727149.4	84.6	1U	NO	
41	PES4060605	06/06/94	251054.6	727338.7	82.3	0.5U	NO	
42	PES4060607	06/06/94	251049.5	727204.0	82.5	0.5U	NO	
44	PES4060801	06/08/94	251049.3	727216.5	82.7	1U	NO	
45	PES4060802	06/08/94	251047.7	727247.5	82.5	1U	NO	
53	PES4061501	06/15/94	251154.8	727152.3	83.4	1.6	NO	
54	PES4061502	06/15/94	251163.0	727171.7	83.9	1400	YES	PES4062301
55	PES4061503	06/15/94	251118.0	727165.5	84.7	450	YES	PES4062303
58	PES4061701	06/17/94	251121.2	727178.8	82.8	10J	NO	
60	PES4062301	06/23/94	251171.0	727165.2	84.2	720	YES	PES4062701
62	PES4062303	06/23/94	251113.3	727164.8	84.9	67	YES	**
63	PES4062701	06/27/94	251169.5	727159.8	84.1	620	YES	PES4062901
64	PES4062801	06/28/94	251090.5	727339.2	82.6	1.0U	NO	
65	PES4062901	06/29/94	251172.4	727155.0	84.0	340	NO	PES4062902
66	PES4062902	06/29/94	251172.4	727149.2	84.0	1.0U	NO	
67	PES4070601	07/06/94	251170.0	727280.0	83.0	690	YES	PES4070703
68	PES4070602	07/06/94	251140.0	727270.0	82.5	180	YES	PES4070704
69	PES4070603	07/06/94	251130.0	727285.0	83.0	230	YES	PES4070704
71	PES4070702	07/07/94	251115.7	727306.2	83.2	11	NO	
72	PES4070703	07/07/94	251163.8	727289.4	82.9	1.0U	NO	
73	PES4070704	07/07/94	251135.5	727285.2	83.1	12	NO	
75	PES4070802	07/08/94	251115.0	727350.0	86.5	2.1	NO	
76	PES4070803	07/08/94	251140.0	727335.0	86.5	1.3	NO	
77	PES4070804	07/08/94	251113.0	727318.3	82.8	1.0U	NO	
78	PES4071201	07/12/94	251140.0	727355.0	82.5	75	YES	PES4071204
79	PES4071202	07/12/94	251145.0	727350.0	82.5	1.0U	NO	
80	PES4071203	07/12/94	251145.1	727343.1	81.9	1.0U	NO	
81	PES4071204	07/12/94	251135.0	727355.0	82.5	50	YES	PES4071301
82	PES4071205	07/12/94	251140.6	727372.3	82.5	1.0U	NO	
83	PES4071301	07/13/94	251131.2	727348.0	82.4	1.0U	NO	

* ACTUAL ELEVATION OF SAMPLE.

** EXCAVATED TO SGL, NO FOLLOW UP SAMPLE REQUIRED.

POST-EXCAVATION FLOOR SAMPLES = ⊕

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	PFSL > 25ppm	FOLLOW UP SAMPLE NO.
5	PES4032113	03/21/94	251045.3	727458.7	84.1	68	YES	PES4033004
6	PES4032114	03/21/94	251085.1	727459.6	82.8	52	YES	PES4033004
9	PES4032901	03/29/94	251060.3	727449.8	83.6	1U	NO	
10	PES4033004	03/30/94	251090.5	727446.2	81.2	1U	NO	
13	PES4033101	03/31/94	251060.6	727429.3	89.2	1U	NO	
14	PES4033102	03/31/94	251095.3	727415.0	89.3	1U	NO	
16	PES4033104	03/31/94	251105.2	727426.9	81.4	1U	NO	
18	PES4040401	04/04/94	251069.1	727374.4	82.9	1U	NO	
25	PES4041101	04/11/94	251100.0	727350.0	84.2	1U	NO	
28	PES4042901	04/29/94	251193.0	727274.3	84.1	0.32J	NO	
33	PES4050404	05/04/94	251206.8	727145.2	87.9	0.1U	NO	
37	PES4060601	06/06/94	251081.6	727188.6	83.4	14000	YES	**
52	PES4061405	06/14/94	251169.7	727154.6	86.4	63	YES	PES4061505
56	PES4061504	06/15/94	251113.2	727162.4	86.4	160	YES	PES4062302
57	PES4061505	06/15/94	251169.4	727154.6	85.3	22	NO	
61	PES4062302	06/23/94	251113.2	727161.0	85.4	1.0U	NO	
70	PES4070701	07/07/94	251150.6	727288.2	85.3	22	NO	
74	PES4070801	07/08/94	251160.2	727321.2	86.1	1.0U	NO	
84	PES4071302	07/13/94	251146.1	727382.4	82.4	1.0U	NO	

* ELEVATION SHOWN IS NOMINAL SURFACE OF EXCAVATION AT TIME OF SURVEYING. SAMPLES EXTENDED TO 6" BELOW SURFACE.

** EXCAVATED TO SGL, NO FOLLOW UP SAMPLE REQUIRED.

POST-EXCAVATION SLOPE SAMPLES = ⊙

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT > 25ppm	FOLLOW UP SAMPLE NO.
38	PES4060602	06/06/94	251072.2	727183.4	86.4	0.89	NO	
39	PES4060603	06/06/94	251088.9	727179.2	84.4	32	YES	PES4061002
40	PES4060604	06/06/94	251099.8	727170.9	84.2	39	YES	PES4061001
43	PES4060608	06/06/94	251048.6	727201.3	86.1	0.5U	NO	
46	PES4061001	06/10/94	251100.4	727167.7	84.8	0.2U	NO	
47	PES4061002	06/10/94	251086.6	727177.6	84.6	990	YES	PES4061702
48	PES4061401	06/14/94	251120.2	727150.8	87.4	10	NO	
49	PES4061402	06/14/94	251140.5	727151.0	83.5	1.1	NO	
50	PES4061403	06/14/94	251160.8	727145.7	87.2	1U	NO	
51	PES4061404	06/14/94	251178.1	727142.7	88.3	1U	NO	
59	PES4061702	06/17/94	251086.9	727171.3	84.6	1.4U	NO	

* ACTUAL ELEVATION OF SAMPLE.

GRAPHIC SCALE

0 20 40 80

(IN FEET)
1 inch = 20 ft.

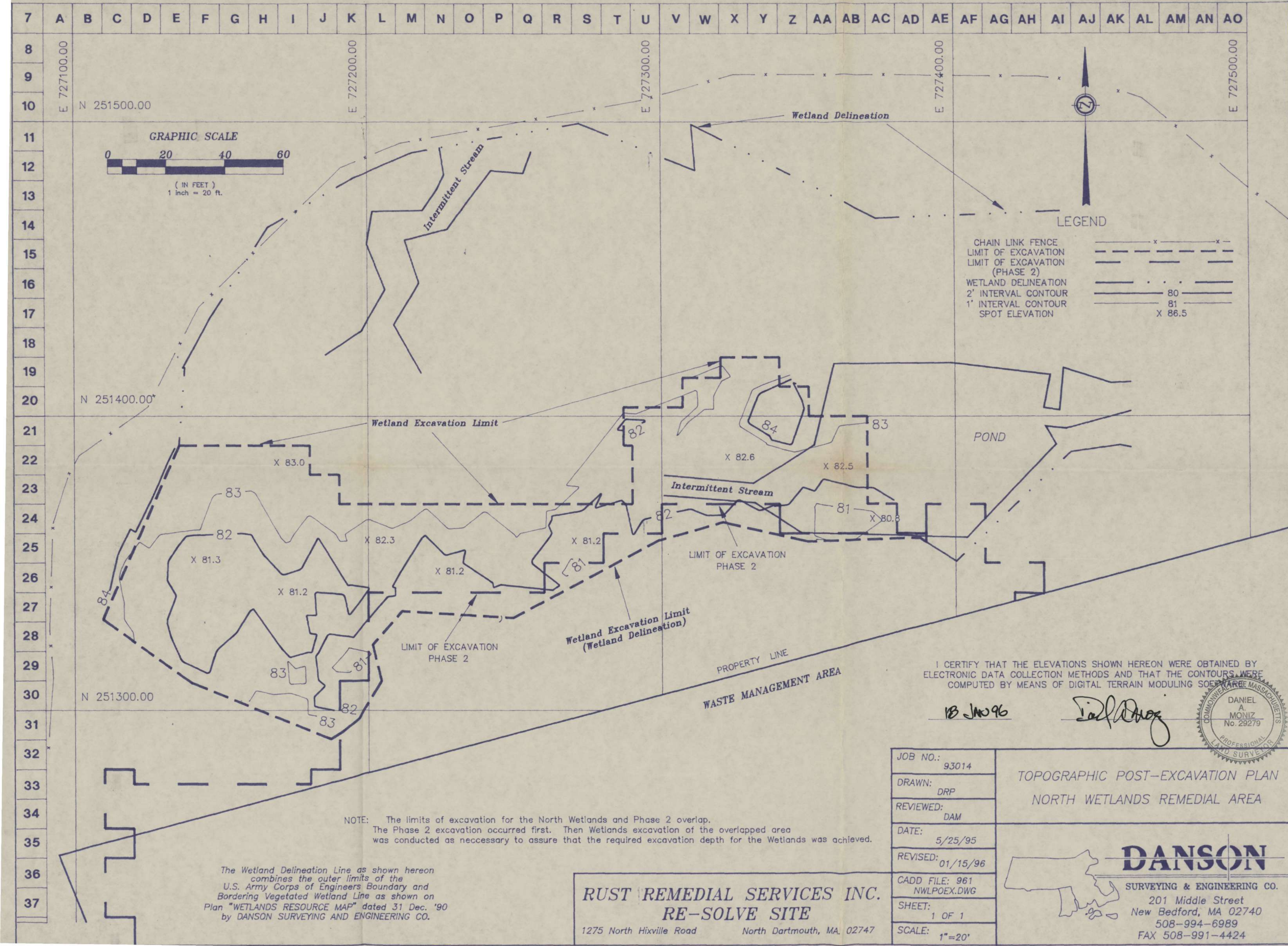
POST-EXCAVATION SAMPLING
WASTE MANAGEMENT AREA – PHASE 7

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 NORTH HIXVILLE ROAD NORTH DARTMOUTH, MA. 02747

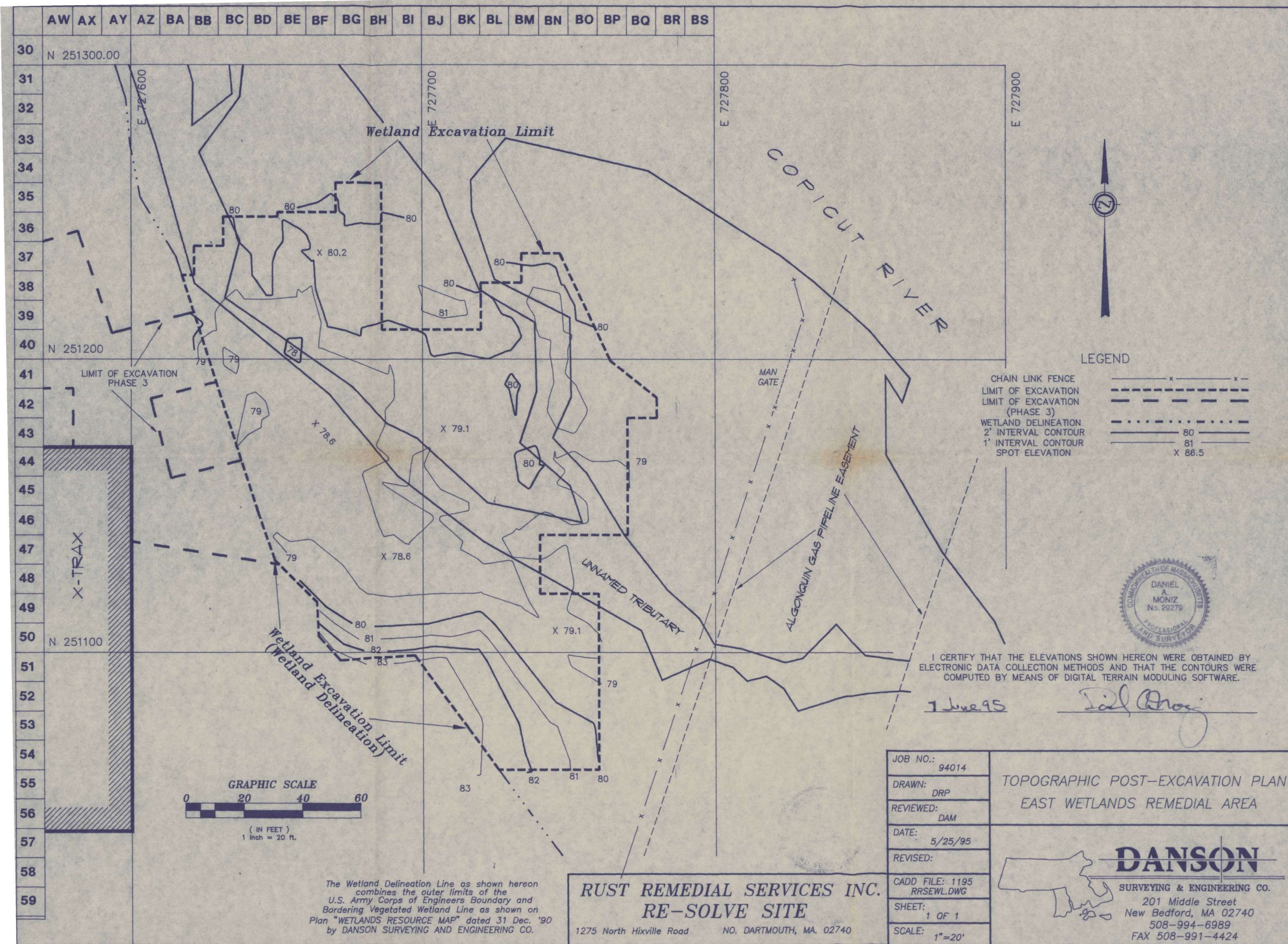
COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ
PROFESSIONAL LAND SURVEYOR

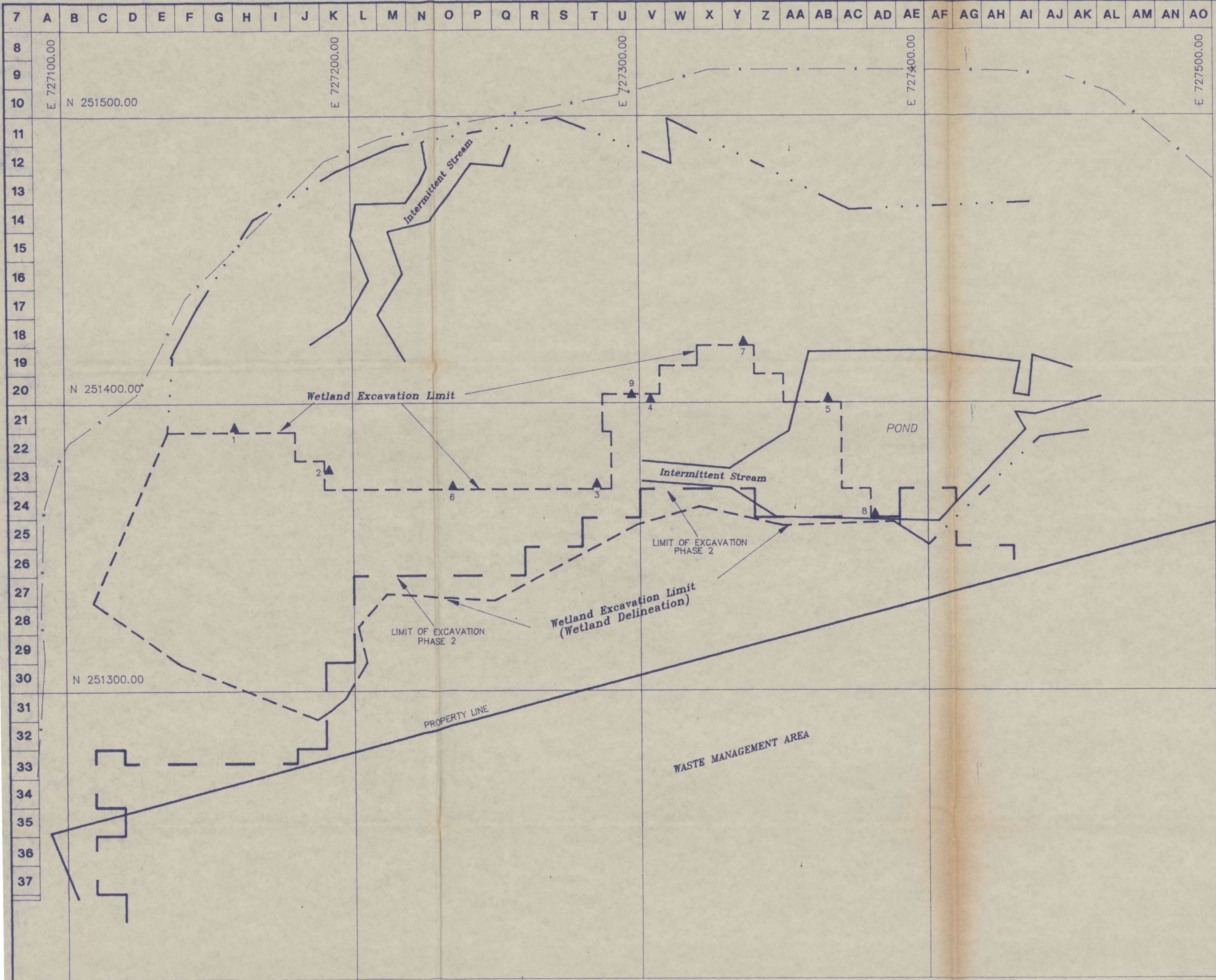
DANSON
SURVEYING & ENGINEERING CO.
201 MIDDLE STREET NEW BEDFORD, MA 02740

Scale:	Date:	Drawn:	Job No.	CHK. BY:
1" = 20'	5/25/95	DRP	94014	DAM
REV: 01/16/96		Drawing No.: 1150 PH7PES.DWG		Sheet No. 1 of 1



GRAPHIC SCALE
0 20 40 60
(IN FEET)
1 inch = 20 ft.
N 251500.00
N 251400.00
N 251300.00
E 727100.00
E 727200.00
E 727300.00
E 727400.00
E 727500.00
Wetland Delineation
Intermittent Stream
Wetland Excavation Limit
LEGEND
CHAIN LINK FENCE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION (PHASE 2)
WETLAND DELINEATION
2' INTERVAL CONTOUR
1' INTERVAL CONTOUR
SPOT ELEVATION
X 86.5
POND
X 83.0
X 82.6
X 82.5
X 82.3
X 81.3
X 81.2
X 80.8
LIMIT OF EXCAVATION PHASE 2
Wetland Excavation Limit (Wetland Delineation)
PROPERTY LINE
WASTE MANAGEMENT AREA
I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.
18 JAN 96
COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MONIZ
No. 29279
PROFESSIONAL LAND SURVEYOR
NOTE: The limits of excavation for the North Wetlands and Phase 2 overlap. The Phase 2 excavation occurred first. Then Wetlands excavation of the overlapped area was conducted as neccessary to assure that the required excavation depth for the Wetlands was achieved.
The Wetland Delineation Line as shown hereon combines the outer limits of the U.S. Army Corps of Engineers Boundary and Bordering Vegetated Wetland Line as shown on Plan "WETLANDS RESOURCE MAP" dated 31 Dec. '90 by DANSON SURVEYING AND ENGINEERING CO.
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 North Hixville Road
North Dartmouth, MA. 02747
JOB NO.: 93014
DRAWN: DRP
REVIEWED: DAM
DATE: 5/25/95
REVISED: 01/15/96
CADD FILE: 961 NWLPOEX.DWG
SHEET: 1 OF 1
SCALE: 1"=20'
TOPOGRAPHIC POST-EXCAVATION PLAN
NORTH WETLANDS REMEDIAL AREA
DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424


Wetland Excavation Limit
COPICUT RIVER
LEGEND
CHAIN LINK FENCE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION (PHASE 3)
WETLAND DELINEATION
2' INTERVAL CONTOUR 80
1' INTERVAL CONTOUR 81
SPOT ELEVATION X 86.5
LIMIT OF EXCAVATION PHASE 3
MAN GATE
X-TRAX
UNNAMED TRIBUTARY
ALGONQUIN GAS PIPELINE EASEMENT
Wetland Excavation Limit (Wetland Delineation)
N 251300.00
N 251200
N 251100
E 727600
E 727700
E 727800
E 727900
GRAPHIC SCALE
0 20 40 60
(IN FEET)
1 inch = 20 ft.
DANIEL A. MONIZ No. 29279
COMMONWEALTH OF MASSACHUSETTS
PROFESSIONAL LAND SURVEYOR
I CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.
1 June 95
The Wetland Delineation Line as shown hereon combines the outer limits of the U.S. Army Corps of Engineers Boundary and Bordering Vegetated Wetland Line as shown on Plan "WETLANDS RESOURCE MAP" dated 31 Dec. '90 by DANSON SURVEYING AND ENGINEERING CO.
RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 North Hixville Road
NO. DARTMOUTH, MA. 02740
JOB NO.: 94014
DRAWN: DRP
REVIEWED: DAM
DATE: 5/25/95
REVISED:
CADD FILE: 1195 RRSEWL.DWG
SHEET: 1 OF 1
SCALE: 1"=20'
TOPOGRAPHIC POST-EXCAVATION PLAN
EAST WETLANDS REMEDIAL AREA
DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424



PRE-EXCAVATION SIDEWALL SAMPLES = ▲

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) **	PCB (PPM)	RESULT > 1ppm	FOLLOW UP SAMPLE NO.
1	PES3052401	5/24/93	251391.5	727159.1	84.6	0.2U	NO	
2	PES3052402	5/24/93	251376.6	727191.8	83.6	0.8U	NO	
3	PES3052404	5/24/93	251371.6	727285.1	83.6	0.5	NO	
4	PES3052405	5/24/93	251401.2	727303.9	83.9	6.1	YES	PES3061505(A)
5	PES3052407	5/24/93	251401.3	727365.5	83.4	0.2U	NO	
6	PES3060303	6/03/93	251371.0	727235.0	83.2	0.4U	NO	
7	PES3060306	6/03/93	251421.3	727336.4	84.2	0.1U	NO	
8	PES3060308	6/03/93	251361.1	727381.5	81.5	0.4	NO	
9	PES3061505(A)	5/15/93	251402.7	727297.3	83.7	0.1	NO	

** SAMPLE WAS COLLECTED FROM 6–12" BELOW ELEVATION INDICATED.

LEGEND

CHAIN LINK FENCE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION (PHASE 2)
PROPERTY LINE
WETLAND DELINEATION
PRE-EXCAVATION SIDEWALL SAMPLE ▲

NOTE: The limits of excavation for the North Wetlands and Phase 2 overlap. The Phase 2 excavation occurred first. Then Wetlands excavation of the overlapped area was conducted as neccessary to assure that the required excavation depth for the Wetlands was achieved.

GRAPHIC SCALE
0 20 40 60
(IN FEET)
1 inch = 20 ft.

The Wetland Delineation Line as shown hereon combines the outer limits of the U.S. Army Corps of Engineers Boundary and Bordering Vegetated Wetland Line as shown on Plan "WETLANDS RESOURCE MAP" dated 31 Dec. '90 by DANSON SURVEYING AND ENGINEERING CO.

RUST REMEDIAL SERVICES INC
RE-SOLVE SITE
1275 North Hixville Road North Dartmouth, MA 02747

COMMONWEALTH OF MASSACHUSETTS
DANIEL A. MOORE
LAND SURVEYOR

JOB NO.: 93014
DRAWN: DRP
REVIEWED: DAM
DATE: 5/25/95
REVISED: 01/15/96
DWG. #: 1239
CADD FILE: NWLPES.DWG
SHEET: 1 OF 1
SCALE: 1"=20'

PRE-EXCAVATION SAMPLING
NORTH WETLANDS REMEDIAL AREA

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424

POST-EXCAVATION FLOOR SAMPLES - ⯐

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
21	PES3101901	10/19/93	251220.2	727629.6	79.0	0.3U	NO	
22	PES3101902	10/19/93	251222.8	727650.1	80.3	1U	NO	
23	PES3101903	10/19/93	251225.9	727674.3	80.5	1U	NO	
24	PES3101904	10/19/93	251194.1	727630.1	85.2	760	YES	PES3102501
25	PES3101905	10/19/93	251160.4	727650.1	79.8	8.4	YES	PES3102504
26	PES3101906	10/19/93	251183.1	727666.2	79.0	1U	NO	
27	PES3101907	10/19/93	251195.0	727704.3	79.9	0.3U	NO	
28	PES3101908	10/19/93	251200.0	727730.3	79.9	0.4U	NO	
29	PES3101909	10/19/93	251219.8	727744.6	78.8	1U	NO	
30	PES3101910	10/19/93	251134.8	727666.0	79.3	1U	NO	
31	PES3102501	10/25/93	251194.4	727630.5	85.2	40	YES	PES3111803
32	PES3102502	10/25/93	251195.3	727644.9	80.5	17	YES	PES3102503
33	PES3102503	10/25/93	251195.3	727644.9	79.5	4.8	YES	**
34	PES3102504	10/25/93	251160.1	727649.7	80.0	1.5	YES	**
46	PES3111803	11/18/93	251194.2	727628.9	81.7	25	YES	PES3112001
47	PES3112001	11/20/93	251194.2	727632.7	80.9	0.84U	NO	

* ELEVATION SHOWN IS NOMINAL SURFACE OF EXCAVATION AT TIME OF SURVEYING. SAMPLES EXTENDED TO 6" BELOW SURFACE.

** EXCAVATED TO SEASONAL GROUNDWATER LOW ELEVATION NO FOLLOW UP SAMPLE REQUIRED.

POST-EXCAVATION SIDEWALL SAMPLES - △

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
35	PES3102505	10/25/93	251180.9	727650.6	79.1	5.9	YES	PES3111301
36	PES3102506	10/25/93	251209.9	727635.1	80.5	310	YES	PES3111304
37	PES3111301	11/13/93	251212.8	727635.0	80.2	250	YES	PES3111302
38	PES3111302	11/13/93	251216.0	727635.2	80.2	38	YES	PES3111303
39	PES3111302	11/13/93	251216.0	727635.2	80.2	3U	YES	PES3111303
40	PES3111303	11/13/93	251218.9	727635.1	79.8	5.8	YES	PES3112401
41	PES3111304	11/13/93	251181.1	727654.1	79.3	2.6	YES	PES3111305
42	PES3111807	11/13/93	251181.1	727654.1	79.3	3.7	YES	PES3111305
43	PES3111305	11/13/93	251180.9	727656.4	79.5	5.3	YES	PES3112403
44	PES3111801	11/18/93	251210.3	727622.2	82.1	1U	NO	
45	PES3111802	11/18/93	251187.9	727626.3	82.9	.078	NO	
48	PES3112401	11/24/93	251222.9	727635.8	79.6	0.1U	NO	
49	PES3112402	11/24/93	251226.1	727636.5	79.7	0.1U	NO	
50	PES3112403	11/24/93	251180.9	727660.5	78.9	1.2	YES	PES3112404
51	PES3112404	11/24/93	251181.3	727664.4	79.0	0.1U	NO	
52	PES4042501	04/25/94	251181.5	727641.8	79.4	1U	NO	
53	PES4042502	04/25/94	251212.2	727625.0	79.9	1.6	YES	PES4042701
54	PES4042701	04/27/94	251210.1	727618.2	82.2	1U	NO	

* ACTUAL ELEVATION OF SAMPLE.

PRE-EXCAVATION SIDEWALL SAMPLES - ▲

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
1	PES3052509	05/25/93	251060.6	727726.9	81.0	0.1U	NO	
2	PES3060310	06/03/93	251083.6	727761.4	80.3	0.7U	NO	
3	PES3060311	06/03/93	251121.8	727741.8	80.6	0.9	NO	
4	PES3060312	06/03/93	251146.0	727751.1	80.7	0.5U	NO	
5	PES3060313	06/03/93	251189.6	727781.3	82.2	0.4U	NO	
6	PES3060314	06/03/93	251215.0	727761.0	79.9	0.1U	NO	
7	PES3060415	06/04/93	251225.0	727739.5	80.1	2.4	YES	PES3061515(A)
8	PES3052516	05/25/93	251210.8	727704.6	81.0	0.2U	NO	
9	PES3060417	06/04/93	251235.0	727681.1	80.8	1.7	YES	PES3061517(A)
10	PES3060418	06/04/93	251251.2	727665.3	81.3	0.1U	NO	
11	PES3060419	06/04/93	251231.1	727633.2	80.6	5.6	YES	PES3061519(A)
12	PES3061515(A)	06/15/93	251225.2	727737.2	80.1	1.1	YES	PES3062415(B)
13	PES3061517(A)	06/15/93	251234.4	727682.5	80.9	3.1	YES	PES3062417(B)
14	PES3061519(A)	06/15/93	251232.9	727633.9	80.5	1.6	YES	PES3062419(B)
15	PES3062415(B)	06/24/93	251224.7	727735.8	80.1	1.4	YES	PES3062415(C)
16	PES3062417(B)	06/24/93	251233.4	727684.6	80.3	3.0	YES	PES3062417(C)
17	PES3062419(B)	06/24/93	251236.2	727634.6	79.7	1.3	YES	PES3062419(C)
18	PES3062415(C)	06/24/93	251224.3	727734.3	80.1	0.6	NO	
19	PES3062417(C)	06/24/93	251232.7	727686.0	80.1	0.6	NO	
20	PES3062419(C)	06/24/93	251238.5	727635.0	80.3	0.1U	NO	

* ACTUAL ELEVATION OF SAMPLE.

LEGEND

CHAIN LINK FENCE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION (PHASE 3)
WETLAND DELINEATION
POST-EXCAVATION SAMPLING AREAS
PRE-EXCAVATION SIDEWALL
POST-EXCAVATION FLOOR
POST-EXCAVATION SIDEWALL

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

The Wetland Delineation Line as shown hereon combines the outer limits of the U.S. Army Corps of Engineers Boundary and Bordering Vegetated Wetland Line as shown on Plan "WETLANDS RESOURCE MAP" dated 31 Dec. '90 by DANSON SURVEYING AND ENGINEERING CO.

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 North Hixville Road North Dartmouth, MA 02747

JOB NO.:	94014
DRAWN:	DRP
REVIEWED:	DAM
DATE:	05/25/95
REVISED:	01/16/96
CADD FILE:	EWLPES
DWG. #	1211
SCALE:	1" = 20'

PRE & POST-EXCAVATION SAMPLING
EAST WETLAND REMEDIAL AREA

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424

LEGEND

CHAIN LINK FENCE	
LIMIT OF EXCAVATION	
LIMIT OF EXCAVATION (PHASE 3)	
WETLAND DELINEATION	
POST-EXCAVATION SAMPLING AREAS	
PRE-EXCAVATION SIDEWALL	▲
POST-EXCAVATION FLOOR	⊕
POST-EXCAVATION SIDEWALL	△

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

The Wetland Delineation Line as shown hereon combines the outer limits of the U.S. Army Corps of Engineers Boundary and Bordering Vegetated Wetland Line as shown on Plan "WETLANDS RESOURCE MAP" dated 31 Dec. '90 by DANSON SURVEYING AND ENGINEERING CO.

POST-EXCAVATION FLOOR SAMPLES - ⊕

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
21	PES3101901	10/19/93	251220.2	727629.6	79.0	0.3U	NO	
22	PES3101902	10/19/93	251222.8	727650.1	80.3	1U	NO	
23	PES3101903	10/19/93	251225.9	727674.3	80.5	1U	NO	
24	PES3101904	10/19/93	251194.1	727630.1	85.2	760	YES	PES3102501
25	PES3101905	10/19/93	251160.4	727650.1	79.8	8.4	YES	PES3102504
26	PES3101906	10/19/93	251183.1	727666.2	79.0	1U	NO	
27	PES3101907	10/19/93	251195.0	727704.3	79.9	0.3U	NO	
28	PES3101908	10/19/93	251200.0	727730.3	79.9	0.4U	NO	
29	PES3101909	10/19/93	251219.8	727744.6	78.8	1U	NO	
30	PES3101910	10/19/93	251134.8	727666.0	79.3	1U	NO	
31	PES3102501	10/25/93	251194.4	727630.5	85.2	40	YES	PES3111803
32	PES3102502	10/25/93	251195.3	727644.9	80.5	17	YES	PES3102503
33	PES3102503	10/25/93	251195.3	727644.9	79.5	4.8	YES	**
34	PES3102504	10/25/93	251160.1	727649.7	80.0	1.5	YES	**
46	PES3111803	11/18/93	251194.2	727628.9	81.7	25	YES	PES3112001
47	PES3112001	11/20/93	251194.2	727632.7	80.9	0.84U	NO	

* ELEVATION SHOWN IS NOMINAL SURFACE OF EXCAVATION AT TIME OF SURVEYING. SAMPLES EXTENDED TO 6" BELOW SURFACE.
** EXCAVATED TO SEASONAL GROUNDWATER LOW ELEVATION NO FOLLOW UP SAMPLE REQUIRED.

POST-EXCAVATION SIDEWALL SAMPLES - △

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
35	PES3102505	10/25/93	251180.9	727650.6	79.1	5.9	YES	PES3111301
36	PES3102506	10/25/93	251209.9	727635.1	80.5	310	YES	PES3111304
37	PES3111301	11/13/93	251212.8	727635.0	80.2	250	YES	PES3111302
38	PES3111302	11/13/93	251216.0	727635.2	80.2	38	YES	PES3111303
39	PES3111302	11/13/93	251216.0	727635.2	80.2	3U	YES	PES3111303
40	PES3111303	11/13/93	251218.9	727635.1	79.8	5.8	YES	PES3112401
41	PES3111304	11/13/93	251181.1	727654.1	79.3	2.6	YES	PES3111305
42	PES3111807	11/13/93	251181.1	727654.1	79.3	3.7	YES	PES3111305
43	PES3111305	11/13/93	251180.9	727656.4	79.5	5.3	YES	PES3112403
44	PES3111801	11/18/93	251210.3	727622.2	82.1	1U	NO	
45	PES3111802	11/18/93	251187.9	727626.3	82.9	.078	NO	
48	PES3112401	11/24/93	251222.9	727635.8	79.6	0.1U	NO	
49	PES3112402	11/24/93	251226.1	727636.5	79.7	0.1U	NO	
50	PES3112403	11/24/93	251180.9	727660.5	78.9	1.2	YES	PES3112404
51	PES3112404	11/24/93	251181.3	727664.4	79.0	0.1U	NO	
52	PES4042501	04/25/94	251181.5	727641.8	79.4	1U	NO	
53	PES4042502	04/25/94	251212.2	727625.0	79.9	1.6	YES	PES4042701
54	PES4042701	04/27/94	251210.1	727618.2	82.2	1U	NO	

* ACTUAL ELEVATION OF SAMPLE.

PRE-EXCAVATION SIDEWALL SAMPLES - ▲

NO.	DESCRIPTION	DATE	NORTH	EAST	ELEV. (FT.) *	PCB (PPM)	RESULT >1ppm	FOLLOW UP SAMPLE NO.
1	PES3052509	05/25/93	251060.6	727726.9	81.0	0.1U	NO	
2	PES3060310	06/03/93	251083.6	727761.4	80.3	0.7U	NO	
3	PES3060311	06/03/93	251121.8	727741.8	80.6	0.9	NO	
4	PES3060312	06/03/93	251146.0	727751.1	80.7	0.5U	NO	
5	PES3060313	06/03/93	251189.8	727781.3	82.2	0.4U	NO	
6	PES3060314	06/03/93	251215.0	727761.0	79.9	0.1U	NO	
7	PES3060415	06/04/93	251225.0	727739.5	80.1	2.4	YES	PES3061515(A)
8	PES3052516	05/25/93	251210.8	727704.6	81.0	0.2U	NO	
9	PES3060417	06/04/93	251235.0	727681.1	80.8	1.7	YES	PES3061517(A)
10	PES3060418	06/04/93	251251.2	727665.3	81.3	0.1U	NO	
11	PES3060419	06/04/93	251231.1	727633.2	80.6	5.6	YES	PES3061519(A)
12	PES3061515(A)	06/15/93	251225.2	727737.2	80.1	1.1	YES	PES3062415(B)
13	PES3061517(A)	06/15/93	251234.4	727682.5	80.9	3.1	YES	PES3062417(B)
14	PES3061519(A)	06/15/93	251232.9	727633.9	80.5	1.6	YES	PES3062419(B)
15	PES3062415(B)	06/24/93	251224.7	727735.8	80.1	1.4	YES	PES3062415(C)
16	PES3062417(B)	06/24/93	251233.4	727684.6	80.3	3.0	YES	PES3062417(C)
17	PES3062419(B)	06/24/93	251236.2	727634.6	79.7	1.3	YES	PES3062419(C)
18	PES3062415(C)	06/24/93	251224.3	727734.3	80.1	0.6	NO	
19	PES3062417(C)	06/24/93	251232.7	727686.0	80.1	0.6	NO	
20	PES3062419(C)	06/24/93	251238.5	727635.0	80.3	0.1U	NO	

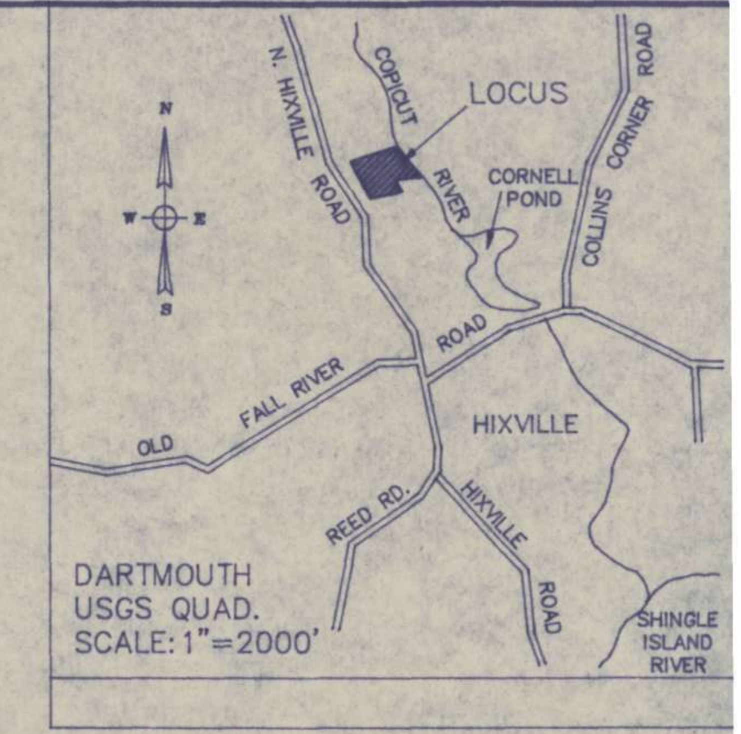
* ACTUAL ELEVATION OF SAMPLE.

JOB NO.:	94014
DRAWN:	DRP
REVIEWED:	DAM
DATE:	05/25/95
REVISED:	01/16/96
CADD FILE:	EWLPES
DWG. #	1211
SCALE:	1" = 20'

PRE & POST-EXCAVATION SAMPLING
EAST WETLAND REMEDIAL AREA

RUST REMEDIAL SERVICES INC.
RE-SOLVE SITE
1275 North Hixville Road North Dartmouth, MA. 02747

DANSON
SURVEYING & ENGINEERING CO.
201 Middle Street
New Bedford, MA 02740
508-994-6989
FAX 508-991-4424



LEGEND

CHAIN LINK FENCE	
CONTOUR LINE	78
PROPERTY LINE	
WETLAND DELINEATION	
EXISTING WELL	ELEV.= 81.22 Ⓦ
WETLAND PIEZOMETER LOCATION	WPZ4 Ⓟ
LIMIT OF GRAVEL PLACEMENT	

NOTE:

1.) ALL ELEVATIONS AT WELL LOCATIONS REFER TO TOP OF CAP ELEVATION.
2.) N 250929.184 (y) REPRESENTS MASSACHUSETTS E 727851.371 (x) GEODETIC CONTROL DATA
3.) ALL ELEVATIONS ARE REFERED TO VERTICAL DATUM AS CONTROLLED BY MASS. GEODETIC SURVEY OF 1929 (NGVD)
4.) BENCHMARK: VERTICAL CONTROL DISK #M6ACC – ELEV. = 82.62
5.) CONTOURS WITHIN THE LIMIT OF EXCAVATION HAVE BEEN COMPUTED TO AN ACCURACY OF 1 FOOT.

GRAPHIC SCALE

50 0 50 100 200

(IN FEET)
1 inch = 50 ft.

I CERTIFY THAT THIS ACTUAL SURVEY WAS MADE ON THE GROUND ON OR DURING THE FALL OF 1990 AND SPRING OF 1991 FOR AREAS WHICH HAVE BEEN UNDISTURBED, AND THROUGH THE SPRING OF 1995 FOR REMEDIATED AND RESTORED AREAS AND THAT THE ACCURACY AND METHODS MEET THE PROCEDURAL AND TECHNICAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE STATE OF MASSACHUSETTS.

I FURTHER CERTIFY THAT THE ELEVATIONS SHOWN HEREON WERE OBTAINED BY ELECTRONIC DATA COLLECTION METHODS AND THAT THE CONTOURS WERE COMPUTED BY MEANS OF DIGITAL TERRAIN MODULING SOFTWARE.

17 JAN 96

JOB NO.:	94014
DRAWN:	DRP
REVIEWED:	DAM
DATE:	2/28/95
REVISED:	01/15/96
CADD FILE:	SITEFAB.DWG
DWG. #	1244
SCALE:	1" = 50'

SITE TOPOGRAPHIC PLAN
EXISTING FINISH GRADES

RUST REMEDIAL SERVICES INC.

RE-SOLVE SITE

1275 N. HIXVILLE ROAD NO. DARTMOUTH, MA. 02740

COMMONWEALTH OF MASSACHUSETTS DANIEL A. MONIZ PROFESSIONAL LAND SURVEYOR

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